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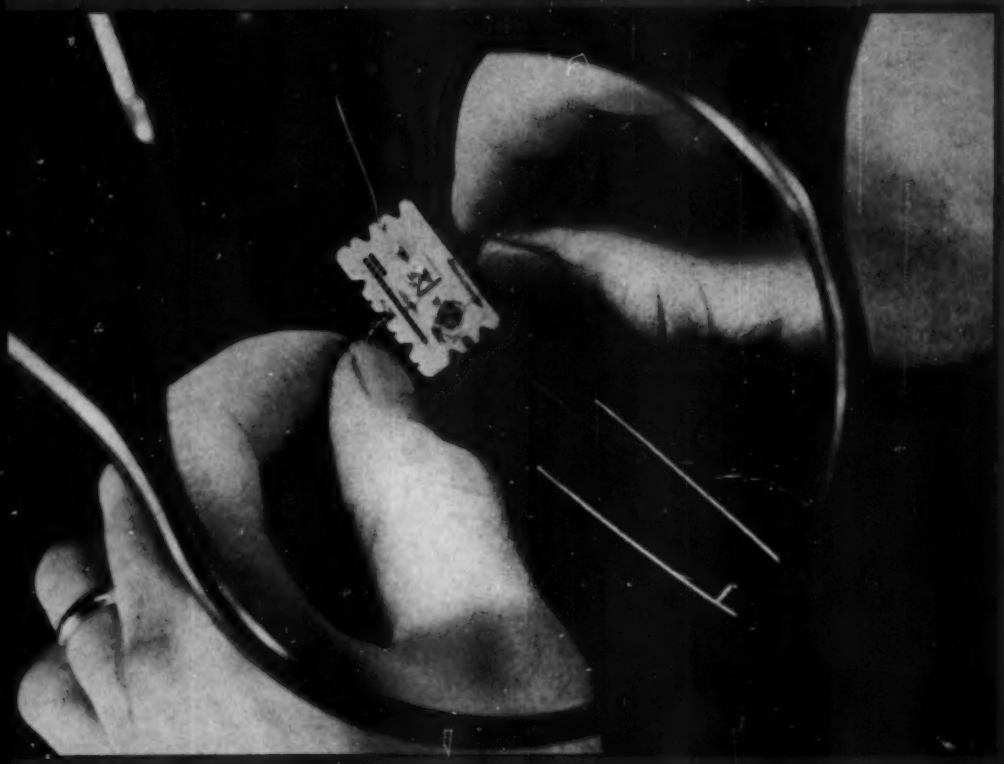
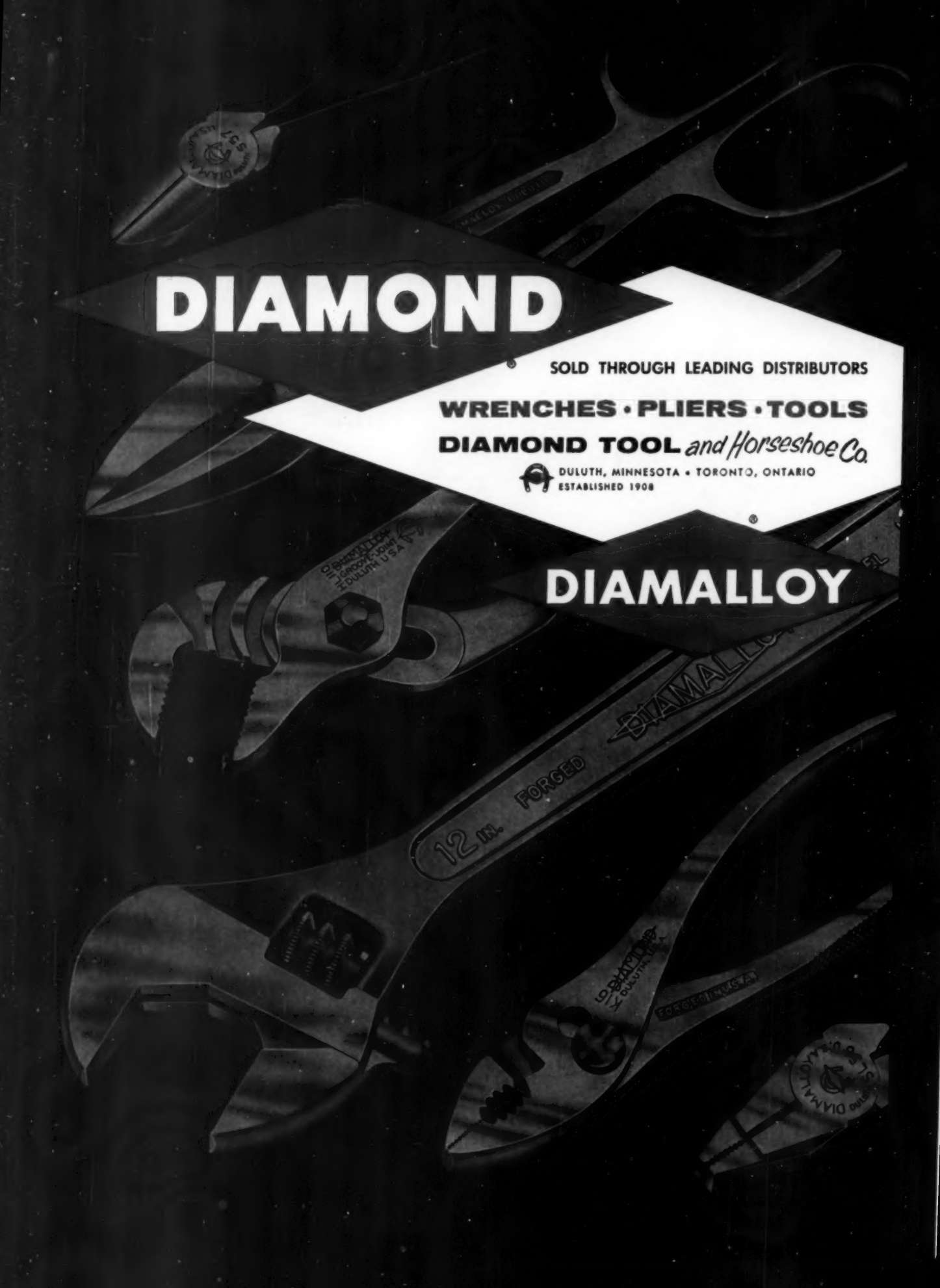


a profile of the exciting and expansive industry of electronics

(see page 54)

- Industrial Arts and Special Education
- What the Shop Teacher Should Know About Liability, Kigin
- What Is Ahead Nationally for Vocational Education, Ash

September, 1960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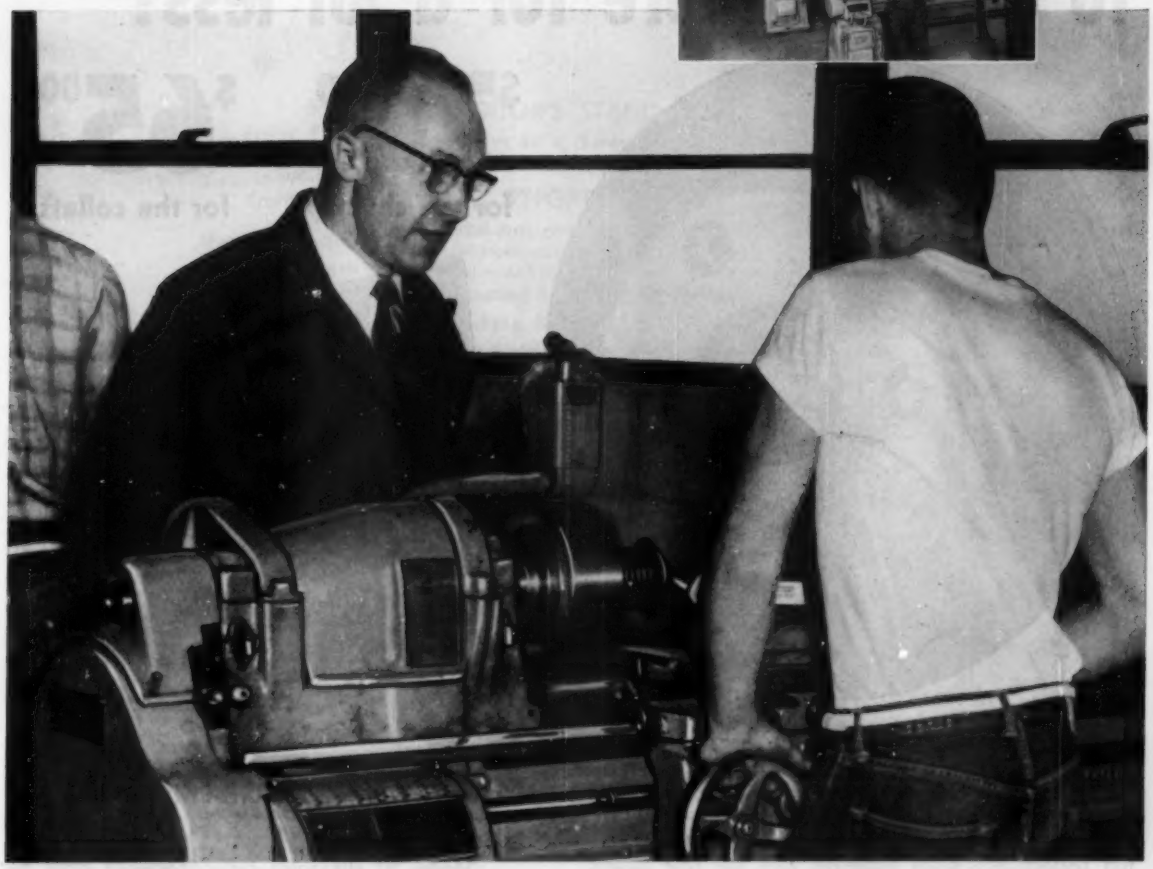

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THE EDITOR'S STAND

Three Keys to a Successful Year 25
A trio of clues for more effective teaching during the coming school year.

SPECIAL REPORT

Industrial Arts and Special Education 46
Important facets of the contribution industrial arts can make to programs for the slow learner, the physically handicapped, and the gifted student.

Preparing I-A Teachers for Exceptional Children, Willoughby . . 46
Teaching Industrial Arts to the Remedial Pupil, Runnalls . . . 48
An Industrial Arts Program for the Slow Learner, Reppe and Wrobel . 49
Industrial Arts for the Physically Handicapped, Echelbarger . . 51
An Industrial Arts Program for the Gifted, Knoll 53
An Enrichment Program for Industrial Arts, Hales 85

FEATURES

A Tribute to a Great Leader: William T. Bawden, Groneman 18
The New Image of Industrial Arts 26
Representatives from "major influences" in American education suggest new directions for space-age industrial arts.
What Is Ahead Nationally for Vocational Education, Ash 28
Trends shaping up for vocational education in the years ahead.
The Challenge of Small Schools to Industrial Educators, Teacher "X" . 31
On Classroom Control, Trasin 33
How to Give a Demonstration, Berger 35
Profiles in Industry: Electronics, Matthews and Winter 54
The first in a new series of articles reporting on the trends in industries important to industrial education.
What You Should Know About Shop Teacher Liability, Kigin . . . 61
A comprehensive discussion of a most vital subject to industrial educators: how to avoid tort liability.
What You Should Know About Glue, Suerken 80

PROJECTS

Put Fishing in the Curriculum, Reissman 37
Magazine Rack for Mass Production Experience, Bernstein 38
An Electronic Race Starter, Mouser 40
Lazy Dine Table, Vasek 42
Ibex, Hunt 44
Production Printing, Davis 45

DEPARTMENTS

Letters, 8
Opinion, 10
News, 14
New Books, 72
Research, 74
Pamphlets, 76
Associations, 78
Personal, 79
Notebook, 80
Capsules, 88
Equipment, 90
Reader's Service Section, 103

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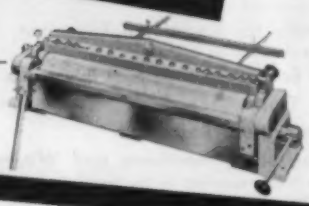

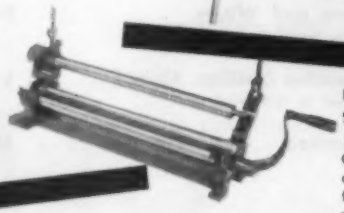

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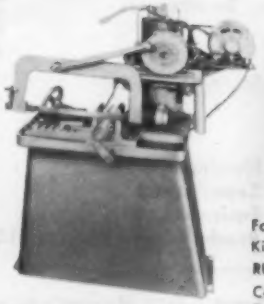

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IA/VE

for September

September, beginning of the "new year" for shop teachers, is the time for renewed enthusiasm and effort. Your IA/VE for this month features a trio of practical articles which we believe you'll find especially valuable in your opening-of-school reading for a more successful school year:

1. A basic, down-to-earth review (pg. 35) on how to give a better demonstration, a vital tool in your kit of teaching techniques.

2. A sane approach to classroom control (pg. 33) with realistic ideas for shaping the "group spirit" of your classes for an effective teaching-learning environment.

3. An inspirational discussion by "Teacher 'X'" (pg. 31) on how he built a better shop program in a smaller community with hints to help any teacher overcome financial restrictions.

In addition there are the usual battery of projects for use during the coming year, with ideas in woods, metals, electricity, graphic arts, etc.

We would also like to call your attention to a number of other features which we hope you will make "must reading": (1) a special report of six articles on *industrial arts and special education* (pg. 46); (2) the most comprehensive periodical material ever published on *shop teacher liability* (pg. 61); (3) an obituary by Dr. Groneman of "a great leader of industrial education," *Dr. William T. Bawden* (pg. 18); (4) a symposium by leaders in American education on *how to improve industrial arts* (pg. 27); and (5) a look ahead to the "new" *vocational education* (pg. 28).

In addition, we hope you'll have a chance to look over our regular departments — especially the "opinion" column (pg. 10) which reports what industrial educators believe about a unified organization for industrial arts and the "notebook" department (pg. 80) with concise but unusually complete data on "what you should know about glue."

for October . . .

The annual "projects" number, your October issue of IA/VE will feature a wealth of project ideas with a portfolio on "how to" professional articles on better project planning. We hope you'll look especially for a symposium of ideas on the "future" of the project by five leaders of the field with a special interest in this subject.

the editors

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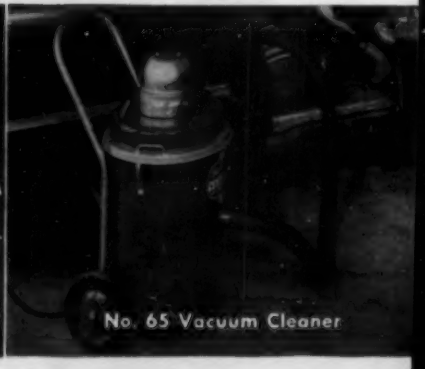

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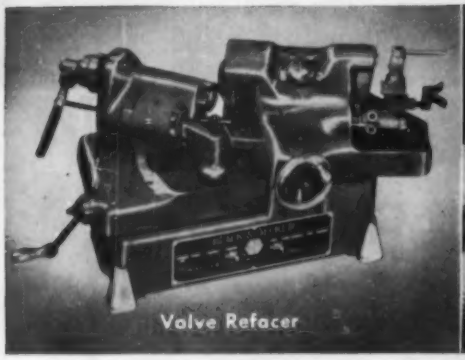

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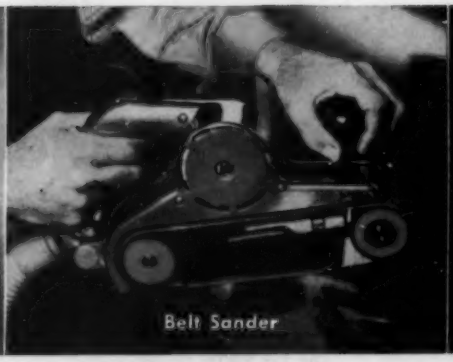

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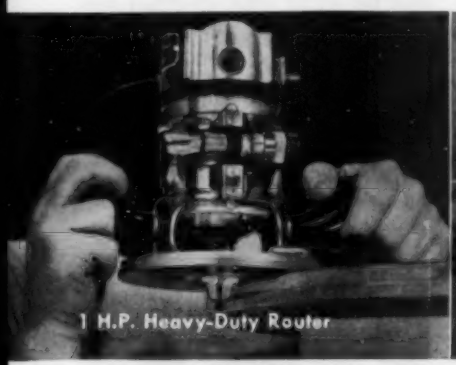

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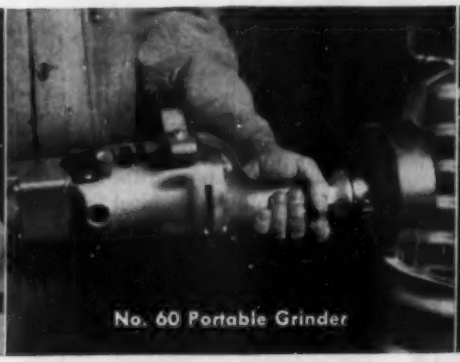

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letters

Dr. Conant challenged

It was a great pleasure to read your article (see pg. 18 of your IA/VE for May) to Dr. Conant. I am happy to see someone finally call him on his ideas and not just accept them! Our staff here at Western has discussed Dr. Conant's remarks and feels that he could better understand the purpose and objectives of industrial education.

Dempsey E. Reid, head, department of Industrial Arts, Western Illinois University, Macomb

It was a very great pleasure to read "What Did You Mean, Dr. Conant?" I suggest that our national association, the AIAA, should offer to correctly inform Dr. Conant about the place and purpose of industrial arts in our schools.

John O. Conaway, associate professor of industrial education, Indiana State Teachers College, Terre Haute

providing activity

In your editorial, "How Do We Provide Activity?" (see pg. 13 of your IA/VE for April) you point out an important thesis, I think. Too long we industrial arts teachers have placed most of the emphasis on the production of projects. It is interesting to note that this unfortunate situation exists in your country as well as in mine. I support your contention that "a first-rate industrial arts program could be carried out with the students' taking home perhaps only one small project." Your suggestions for providing activity bear repeating again and again.

A. M. Hay, industrial arts instructor, Newmarket District High School, Newmarket, Ontario, Canada.

"what do you think?"

I have enjoyed reading your new column, "What Do You Think?" (see pg. 4 of your IA/VE for May).

Concerning the topic, "Should Teacher-Selected Standardized Products Be Used in Beginning Industrial Arts Classes?" I am inclined toward the "yes" side as expressed by Isaac P. Hampton.

The key word in the question is BEGINNING. Considering this as a main point of reference it is possible to do a much better and more intensive job of teaching specific skills and operations to all of the students if they are all working on a project which has identical constructions. This will mean that all of the students will be interested in every demonstration which is given by the teacher.

However, I have one alternate idea to suggest. Instead of requiring one standardized project for the entire class, would it not be a better idea to have a group of selected projects, 4 or 5, all with the same type of construction and operations. From this group each student would be able to select the project which would best meet his interests and ideas. After the completion of the first project I feel that the students should have free choice of the project they desire to construct; of course, final approval of the project will always rest with the teacher as individual differences and ability must always be taken into consideration.

Graham R. Chase, chairman of the industrial arts department, West Hartford, Conn., Schools

on the offensive

May I have permission to copy "Let's Take the Offensive" (see pg. 13 of your IA/VE for June)? I wish to distribute this editorial to every administrator in our school system.

Truman N. Chase, administrative assistant in charge of industrial arts, Fairfield, Conn., Schools.

▶ Our readers may reprint articles from IA/VE providing they credit the magazine someplace on their copies. Distributing material from IA/VE to administrators can be an excellent public relations device for alerting administrators to what is happening in industrial education!

oops!

I would like to call to your attention the fact that you failed to note Robert Weirick as coauthor with me of the article, "Our Class in Scale" (see pg. 29 of your IA/VE for May).

Richard F. Doutt, instructor, University School, Northern Illinois University, DeKalb

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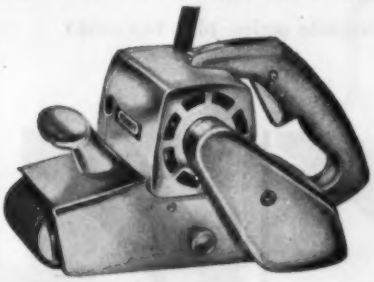

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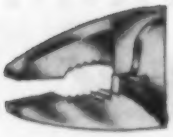

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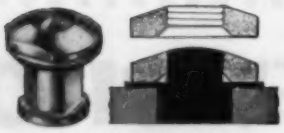

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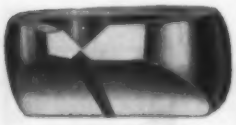

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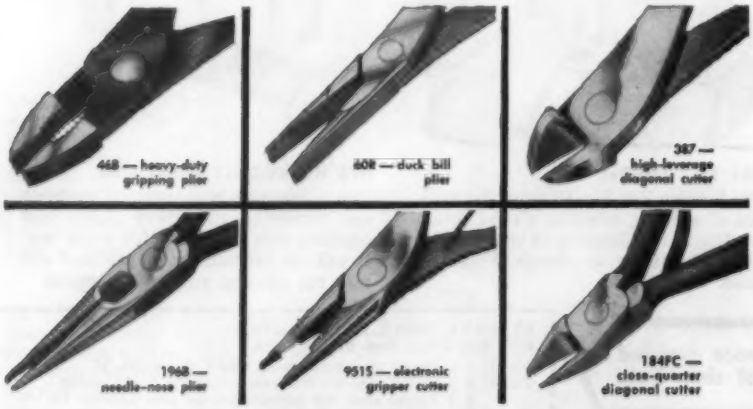
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opinion

IS A UNIFIED ORGANIZATION NEEDED FOR INDUSTRIAL ARTS?

Asked this question, a list of industrial educators (teachers, district supervisors, and teacher educators selected at random) voted an overwhelming (92 per cent) "yes!"

Comments concerning this question include those of a teacher who believed "definitely" in this unity because "industrial arts and vocational (education) are doing the same job different only in degree. Both are a segment of general education." Another stated that "This, in my opinion, is essential to professional stature for the area of industrial arts education."

A supervisor, in voting affirmatively, enumerated these reasons why such an organization is needed: "the high cost of the

Should Industrial Arts Have a Unified Professional Organization That Can Speak Out With One Voice for the Group?

Yes 92% No 8%

IA and VE program; non-tenured teachers need an authoritative voice; the (present) professional organizations only partially fit the bill on the subject of recognitions and rights; state associations are fine as far as they go; our problems are unique enough to not be understood by most educators. A national voice would establish IA and VE in its rightful place in the curriculum and would help those who don't understand, but don't like to inquire, just what we are trying to do. Industry is anxious to help. This I feel would make it easier for them to do so."

A teacher educator, voting affirmatively, qualified his vote by adding "Many if's here!"

A representative of the AIAA voted "yes," providing "Industrial arts people are notified of what the problem and the main issues are at hand, and what the organization is vitally interested in promoting. If the issues are being promoted are not the ideas of a limited few, and not trying to advance things for their own benefit, but will benefit the entire organization."

Other comments: "A great deal of good can come from such an organization"; "It has always been my belief that industrial arts has not been given the recognition it should be given. If through a unified professional organization it can achieve this goal, I am all for it"; "I am very concerned about this and I feel that industrial arts should watch out and not get swallowed up by other (areas of the curriculum."

One vocational educator, in voting a "no," suggests that the "AVA should strengthen the position of industrial arts as it relates to a membership drive and/or efforts to help sell memberships. The individual teacher will have to be sold."

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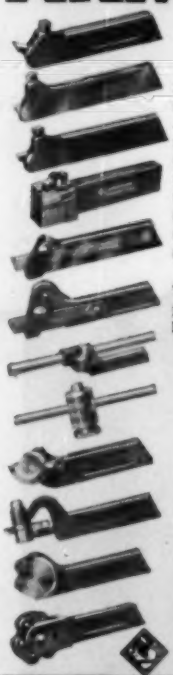

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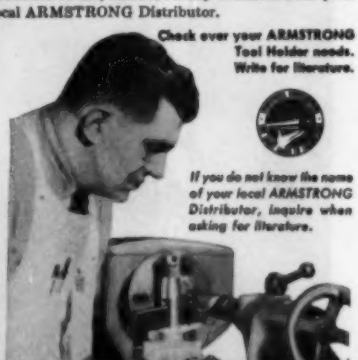

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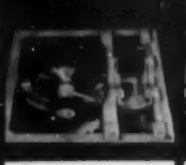

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news

OE conference on industrial arts The Office of Education held a conference on June 20 and 21 on industrial arts. The theme was "Improving Industrial Arts Teaching in the Public Schools." According to Commissioner L. G. Derthick, "The purpose of the conference was to discuss and clarify some of the major problems and issues in the field of industrial arts brought about by current curriculum movements in the public schools and the changes in our industrial society." (For more details, see Commissioner Derthick's comments in "The New Image of Industrial Arts," pg. 26).

Conant for industrial education In the May, 1960, issue of the *Ladies Home Journal*, Dr. Conant supported the need for stronger programs of industrial education in America's high schools. He advised parents of "the danger of trying to force down the throats of all children of high school age a diet suitable only for those with academic talent." He criticized "'snob values' clinging to our educational system" and the "misery" resulting from the "false prestige" of academic education for all youth whether college-bound or not, as advocated by certain academicians. "We must not forget the development of the manual skills," he stated.

ia and the gifted A recent study by the Florida State Department of Education of the top 15 per cent of the 1959 high school seniors revealed significantly that industrial arts content does challenge the ingenuity of the talented student. Of the 2971 seniors in the study, for instance, 1257 or 42.4 per cent enrolled in industrial arts courses. Of these, 15 per cent enrolled in drafting, 12.4 in general shop, 4.6 in woodworking.

surplus equipment available The sale of electronic items, communications and photographic components, and other equipment usable in industrial education shops and science laboratories has tripled in the past year and a half because of the establishment of 20 "supermarkets," according to a report from secretary Arthur S. Flemming of the Department of Health, Education, and Welfare. On specified days, teachers can buy these items at the 20 major supply points. A "how to shop" manual is available from the department.

golden anniversary A half century of research at the U. S. Forest Products Laboratory was reviewed, discussed, and used to project future needs of the wood industries as the institution

(Concluded on page 16)

surveying the school scene

- The number of births went up again in 1959 to 4,249,000, indicating the number of school age children will be 10 per cent greater in 1965 than it is now.
- A reported compromise of school construction bills in the Senate and House (with differences in amount, years of distribution, distribution formula, etc.), failed to materialize and no immediate action toward passage of a bill for federal aid is anticipated in the current Congress.
- The U. S. Office of Education reported that $12 billion was spent to support the nation's public schools in the 1957–58 school year, a more than fivefold increase since the 1937–38 total of $2.2 billion.
- The NEA has begun a comprehensive inventory of space-age changes in the nation's high schools. The two-year project is designed to probe the "rationale" behind recent changes in school programs.
- The Washington, D. C., school board building and grounds committee has asked school planners to consider building a windowless, air-conditioned school in northeast Washington.
- The Southern Education Reporting Service reported that the previous school year ended with 749 public school districts desegregated, totaling one fourth of the bi-racial districts, in the 17 southern and border states.

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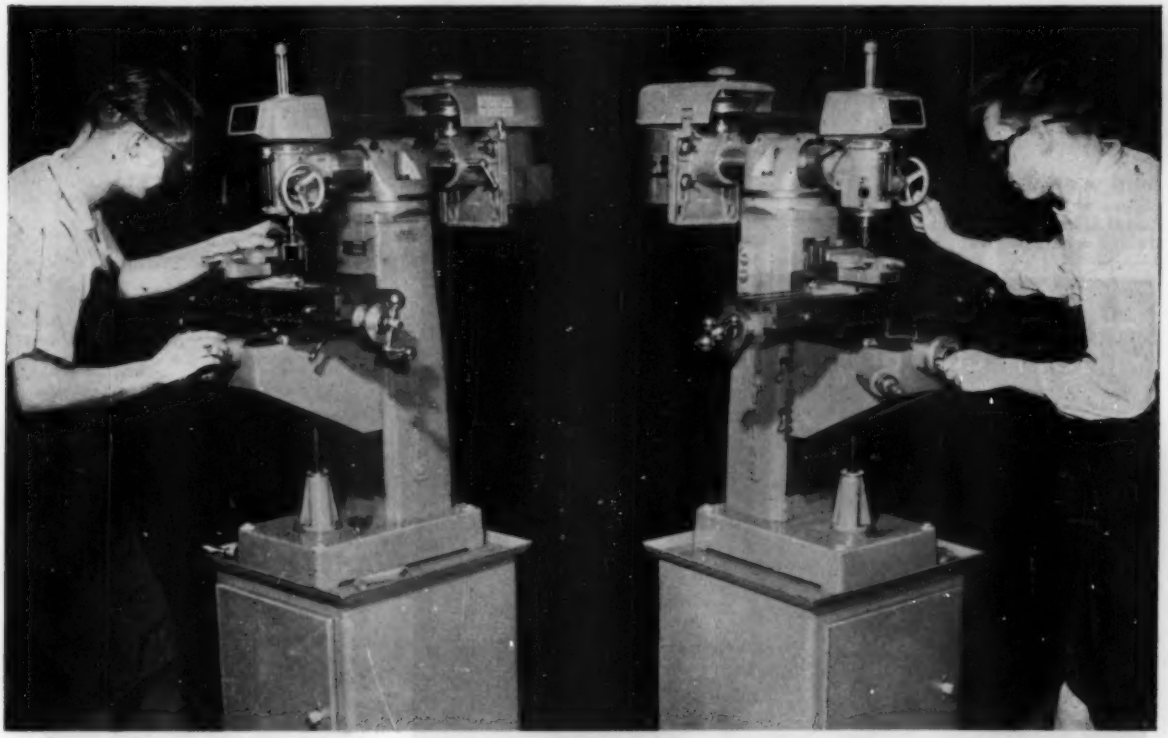

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NEWS

(Concluded from page 14)

celebrated its golden anniversary at Madison, Wis., June 2–4. Industry leaders, educators, scientists, and government administrators were on hand when the world's first research laboratory of its kind put on exhibit many fruits of its past work and current investigations as some 5000 guests and visitors looked and listened. The occasion commemorated the founding of the Laboratory on June 4, 1910, by the Forest Service, U. S. Department of Agriculture, in co-operation with the University of Wisconsin.

pilot workshop State University College of Education, Oswego, N. Y., conducted a pilot workshop for industrial arts teachers who work with the blind during its summer session. A grant of $25,400 from the Office of Vocational Rehabilitation, a division of the U. S. Department of Health, Education, and Welfare, permitted five blind high school students to work in a laboratory school situation with the industrial arts and industrial-vocational graduate students who developed appropriate industrial arts projects and techniques for them.

teaching machine built by i-a classes An industrial arts class at Michigan State University, in fulfilling an assignment in mass production, constructed a simple self-instructional device (a "teaching machine") for a material (plywood and masonite) cost of $2.

disabled veteran bill ends A training program which has been the key to independence for nearly two thirds of a million disabled World War II veterans ended on July 25. The 17-year-old Public Law 16, the Vocational Rehabilitation Act, trained more than 615,000 veterans, 95 per cent of which are employed in skills they learned in the training at a salary twice the amount before the training.

new course in building trades The Humble, Tex., high school offers a new pre-employment course in the building trades (carpentry, plumbing, wiring, concrete work, sheetrocking, painting, cabinet and millwork, bricklaying, roofing, etc.) designed to develop skill in the use of machines and tools in building, repairing, and maintenance. It will give the student an understanding of mathematics, blueprint reading, building designs, safety, etc.

no vo-ag at Roseburg The Roseburg (Ore.) School Board recently elected to take no action on a request by local citizens that the board reverse its February decision to eliminate the vocational agriculture program for the coming year. The way was left open for reinstating the vocational agriculture program in the future, however. The need for classroom space was the determining factor.

new science building The Milwaukee School of Engineering gained substantially with the addition of the newly completed Allen-Bradley Hall of Science building on E. Kilbourn Avenue. The Allen-Bradley Foundation contributed $1,150,000 to the school's improvement and development, and has made an additional gift of $300,000 to equip the new building.

college name changed Formerly known as the California State Teachers College, at California, Pa., the name of the school is now California State College.

progress of Title VIII Title VIII of the NDEA (area vocational education program) at midpoint has already aided training for 48,500 students in over 20 schools. The second year will see, according to predictions, the student enrollment "well over 85,000" with an expenditure of $7 million over 1959's $3.75 million.

challenge I-A students Industrial arts programs which emphasize people instead of projects and the uniqueness of students, rather than their likenesses, was prescribed by Donald Maley, head of the industrial education department at the University of Maryland, College Park, at the annual Industrial and Practical Arts Conference sponsored by the New York State University at Oswego. Stimulation of individual potential and the utilization of research are more important emphases than project production, according to Dr. Maley, who called for an "intellectual sophistication" for industrial arts by including mathematics, science, problem solving communication skills, and consumer literacy.

announce project winners The names of 639 winners, including 32 winners of the highest, "Outstanding Achievement Awards" prizes, have been announced by the Ford Motor Company in its 14th annual Industrial Arts Awards contest. Judges selected the winning projects from about 4000 entries.

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A Tribute to a Great Leader

CHRIS H. GRONEMAN

"Whatsoever thy hand findeth to do, do it with thy whole might. — Work — while it is called Today; — for the Night cometh wherein no man can work."

— Thomas Carlyle

No expression could better characterize our recently departed, great leader, Dr. William Thomas Bawden. Dr. Bawden was identified with education, and more particularly with industrial arts and vocational education, for so many years and in so many ways with such a great telling force that he was singularly recognized throughout our great nation as well as beyond its borders.

His contributions to education and society were the direct results of his desire for improvement, if not perfection. He was a great motivating force which helped shape the fields of industrial arts and trade and industrial education, even prior to the passage of numerous federal subsidies for the vocational phase.

It was he, along with a few other great leaders of his time, who kept industrial arts from diminishing to an obscure, unimpressive program following the passage of the Smith-Hughes Law. He was among those active in analyzing the contributions of industrial arts and formulating the basic principles which gave industrial arts the leadership in that early era.

Dr. Arthur B. Mays, professor emeritus from the University of Illinois, prepared a very fine statement in 1945 under the caption of "A Toast to Dr. Bawden." This article appeared in the American Vocational Association Magazine when Dr. Bawden retired from his active administrative duties at the Kansas State College at Pittsburg to assist this fine institution for the next several years in writing historical documents about the school.

Dr. Mays stated: "He has made an outstanding contribution to the professional preparation of industrial teachers. The influence of his work will remain a constructive educational force for years. His success in building an unusually effective program of graduate study for teachers of industrial subjects is one of his most notable achievements. His leadership and sound educational judgment have played an important role, not only in the development of industrial education but also in the progress of secondary and higher education in the United States." Such a statement would only be made of one with an enviable record such as was developed through Dr. Bawden's professional career and lifetime.

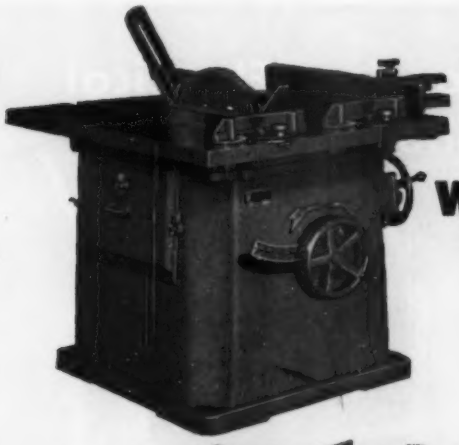
He was a modest person. Readers of educational literature will well remember the impact of his series of articles entitled, "Leaders in Industrial Education," which appeared in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine. (The articles began with the June, 1947, issue with an introductory statement of the motives for preparing such material and then the chronological and analytical presentation of many leaders through the 1955 issues.) It would appear ironical that all of the many biographical sketches were written by a person who was intimately acquainted with each, with the exception of one or two of the earlier ones but should not include his autobiography. There was one prepared, but through his modesty it was never released to the magazine.

Space would not permit the complete biographical sketch of Dr. William Thomas Bawden who was born November 6,

(Continued on page 22)

Upper left: (1909) head, department of manual arts, Illinois State Normal. Right (1919) assistant commissioner of education. Lower left: (1928) associate superintendent, Tulsa, Okla., schools. Lower right: (1941) head, department of industrial education, Kansas State Teachers College, Pittsburg.

Dr. Groneman is head of the department of industrial education, Agricultural and Mechanical College of Texas, College Station.



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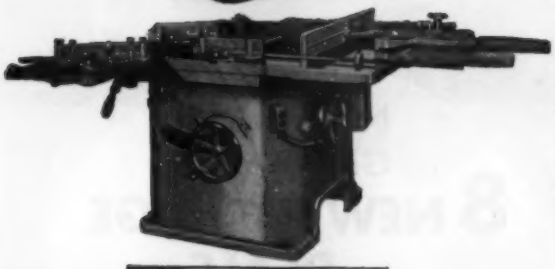

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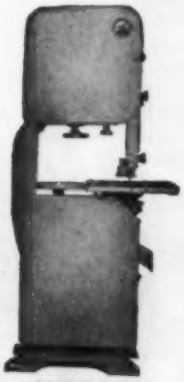

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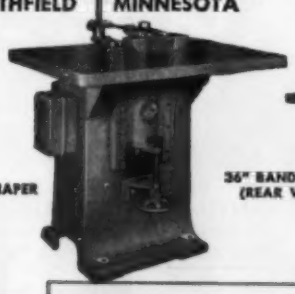

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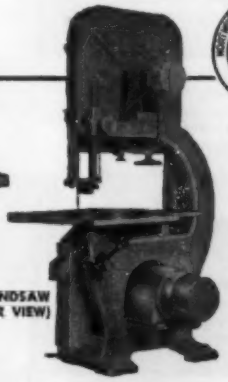

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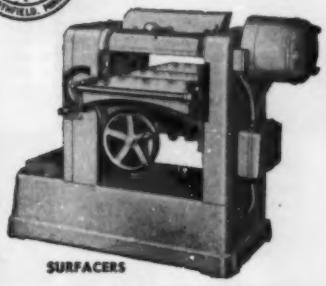

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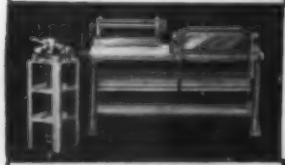

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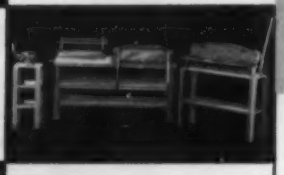

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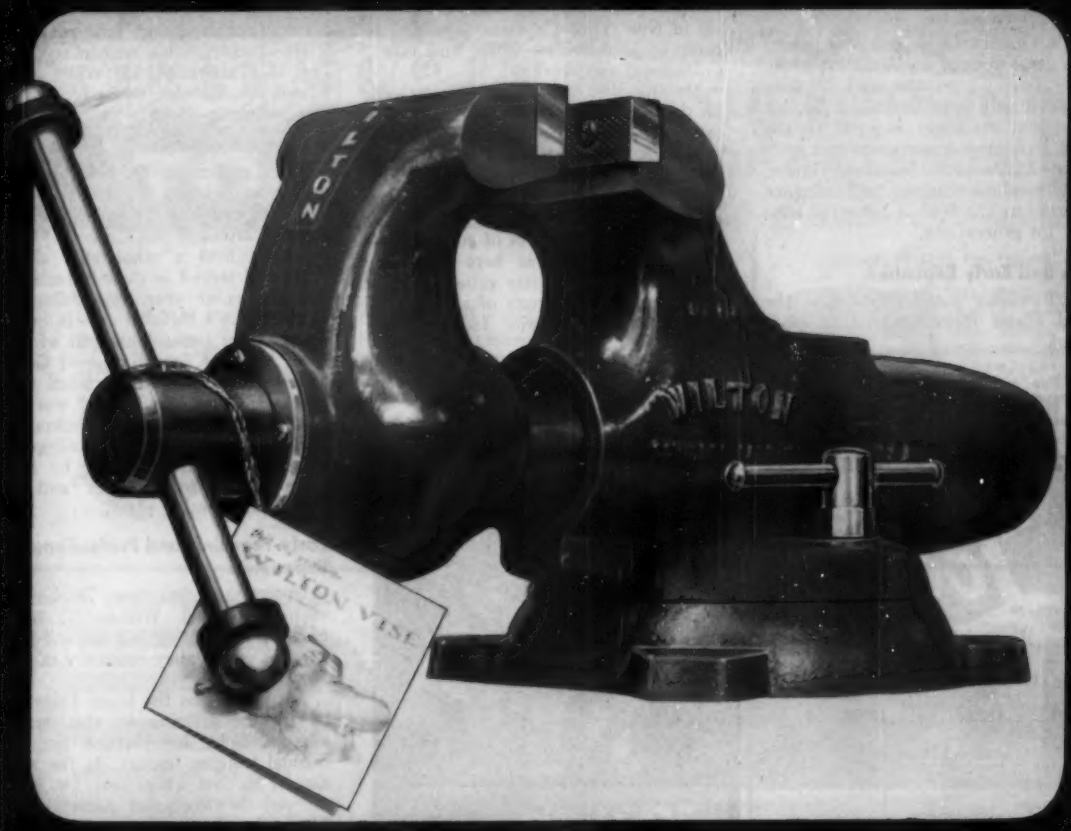

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DR. BAWDEN

(Continued from page 18)

1875, in Oberlin, Ohio, and who passed to his great reward on April 27, 1960. His 84 years, 5 months, and 21 days were filled with activities which he, his family, and associates enjoyed to the fullest. It is most unfortunate that such a great leader must leave our midst. His philosophies, teaching, and influence will permeate the field of industrial education for generations.

Youth and Early Education

Dr. Bawden's ancestors came to the United States from England in 1843. His interest in industrial education developed quite naturally because his uncle in New York City was a manufacturer of iron fences, grills, and other ornamental iron work.

Dr. Bawden was formally educated in the elementary schools of Dayton, Ohio, where his father held a church pastorate. He received much of his early inspiration for an education in industry by accompanying his father as they called on parishioners. Often they would find them at their places of employment and factories. It was here that Dr. Bawden, as a youngster gained a keen insight into the interests of a soap factory, varnish and paint factory, shoe last factory, railroad shops and round houses, printing establishments, and agricultural implement industries.

He completed his elementary education in Champaign, Ill. While in high school, Dr. Bawden worked as a helper in a machine shop.

Higher Education

After graduating from Doane Academy, a preparatory department of Denison University in Granville, Ohio, Dr. Bawden attended this University. While there he held a scholarship all four years and served as class historian during his senior year. His college curriculum was a classical one. It included five years of Latin, four years of Greek, three years of French, one of German, and one of Italian. He studied mathematics through calculus and was a distinguished scholar in the sciences. In summer vacations from colleges, he gained industrial experience by serving as a brickmason's helper and in a newspaper printing plant.

Early Teaching and Professional Experience

Upon graduation from Denison University in 1896, William T. Bawden taught mathematics, history, and French in the Cedar Valley Seminary in Osage, Iowa.

His interest in the lesser known field of manual training in that era was stimulated by his brother, Samuel, a manual training teacher. At the conclusion of his first school year, Dr. Bawden entered the Rochester Athenaeum and Mechanics Institute in a special one-year curriculum for the preparation of teachers of manual training. He studied courses in woodworking, free hand drawing, design, and mechanical drawing. During the winter he assisted one of the instructors in teaching two evenings a week.

In 1898 he accepted a teaching position in the New York State Reformatory at Elmira where he taught wood turning and patternmaking. After one year, he joined the teaching staff of the Buffalo, New York, public schools as a manual training teacher. (Also in 1898 he married Ora Richardson of Parkersburg, W. Va. Their only son, William, Jr. is now an executive with Marshall Field and Company.)

During his second year as a teacher in Buffalo, Dr. Bawden was invited to read a paper at the manual training section of the New York State Teachers Association. The topic for his talk was "Impression, Then Expression." He was a great advocate of design first.

In 1900, he attended his first meeting of the Eastern Manual Training Association in Cleveland. At that convention he met for the first time William E. Roberts, supervisor of the Cleveland, Ohio, school program and professor Charles R. Richards of Teachers College, Columbia University, as well as other leaders. This was the beginning of his very extensive acquaintance with leaders in industrial education.

(Continued on page 86)

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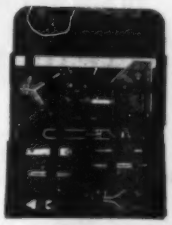

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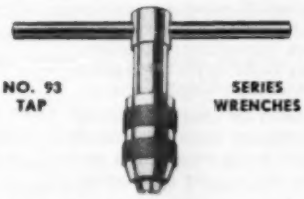

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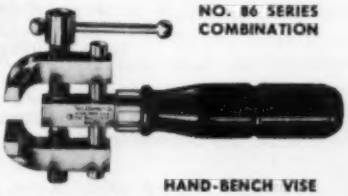

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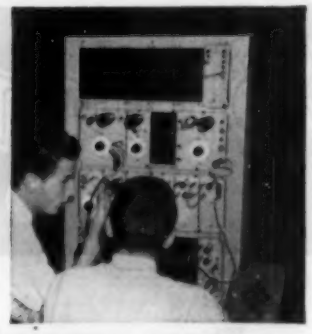

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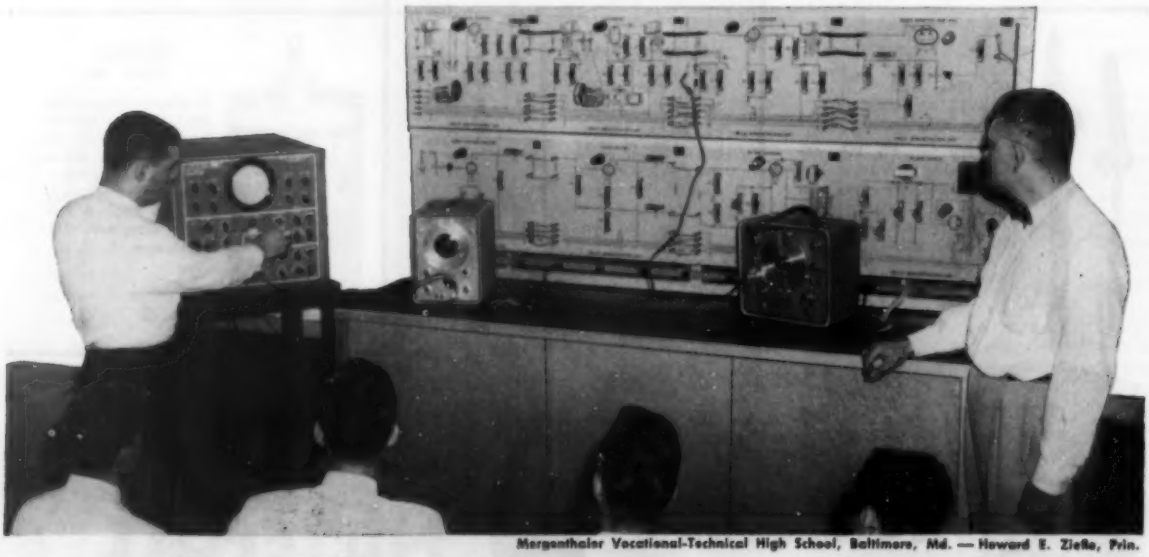

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the editor's stand

THREE KEYS TO A SUCCESSFUL YEAR

At the beginning of the school year, most of us come back to our jobs renewed, refreshed, and revitalized. As professional teachers, we vow to ourselves that we will do a better job than we did last year. We promise ourselves that in the future we will avoid the pitfalls that discourage us. With this fresh point of view, how can we assure ourselves that the new year will be a successful one?

As the months go by, we are buffetted by many people and things. It's easy to forget our resolutions and our purpose in school life. Many people — administrators, parents, other teachers, even the students themselves — try to tell us what to teach, how to teach it, and what things we ought to do. We often end the school year in confusion, discouragement, and discontent.

However, we believe that there are three things that we can do to avoid many of our difficulties:

1. Have a well-defined course of study that includes the basic instructional needs for yourself as a teacher and for the students.

A common criticism leveled against many industrial education teachers is that they fail to provide carefully planned instructional programs. Too much of their teaching is "off the cuff." They do not recognize the obvious fact that the unorganized course makes teaching infinitely more difficult and confusing. Teaching can be pleasant and rewarding only if the course is well organized.

The ideal "tool kit" course of study that every industrial education teacher should have includes these items: (*a*) *A basic textbook*. Students in every course in industrial education should have textbooks of their own that can be carried with them and used both in and out of the shop; (*b*) *A lesson plan for each instructional unit* including the lessons in which skills, information, concepts, understandings, and applications are taught; (*c*) *A product file* including suggested individual projects, mass-production projects, shop experiments, research projects, etc.; (*d*) *Workbooks and study-guide materials* including lesson assignments, outside assignments, mathematics, science, and language assignments, and other related student work; (*e*) *Organization and time schedules* including the units to be covered and the time schedule to be followed; (*f*) *Shop management materials* including cleanup and personnel organization charts, supply routines, etc.; and (*g*) *Evaluation materials* including progress charts, written tests, performance tests, project-rating scales, and student-rating scales.

2. Establish standards of achievement.

Another frequent criticism of shop classes is that the students are not required to perform to their maximum abilities. In many shops the students get by with as little work as they want to do. As a consequence, many students do very little. *Students need to be told what is expected of them.* They should know what the minimum standards are, what is expected of average students, and what is expected of above-average students. Most teachers soon learn how much the average student can accomplish in a semester or year.

If we don't set standards, even the best students tend to "loaf on the job." Some teachers may expect too much, but this is not the usual problem in industrial education. To fail to tell students what we expect of them is to let them down. High school students, and especially junior high school boys, need direction. When we don't give it to them, they lose confidence in us and in themselves. Our standards of craftsmanship should be high. Sloppy work should not be tolerated. Our design standards should be carefully checked. We should not allow students to build "bastard" type furniture or metal projects. We should assign textbook assignments and home work. *Both skill development and book learning are important in industrial education.* We can have standards and still operate a shop in a democratic atmosphere of learning.

3. Evaluate what the student has accomplished.

We should have an organized plan of evaluation. Students should be given tests on information, application, and understanding. They should be given written tests on their book work and other related information. Students should know that you carefully evaluate their performance in the shop and through the completed project. They should know *that you care how much work they do and how well they do it.*

We believe that if each one of us teachers followed these three keys to success, we would know and the students would know also that something important had been accomplished in the year's course in industrial education.

John L. Feirer

The New Image of Industrial Arts

Lawrence G. Derthick
Commissioner, U. S. Office of Education

strength by "more accurately reflecting our changing technology"

Interest in suggestions for the improvement of industrial arts is very timely indeed because on June 20 and 21 the office of education held a conference on industrial arts.

The purpose of the conference was to discuss and clarify some of the major problems and issues in the field of industrial arts brought about by current curriculum movements in the public schools and the changes in our industrial society. The theme of the conference was *Improving Industrial Arts Teaching in the Public Schools*. The problems discussed were as follows:

1. What is the place of industrial arts in the American culture?
2. What objectives should be emphasized?
3. What guidelines should be followed in determining curriculum content for students in industrial arts?
4. What implications are there in Soviet polytechnic education for industrial arts?
5. What is the relationship of industrial arts to other school curriculum areas?
6. What changes are needed in industrial arts to meet the needs of the gifted and slow learner?
7. What curricular changes need to be made in industrial arts to best reflect technology and the needs of the students?
8. What competencies are needed by the industrial arts teacher to meet the challenge of the future?

These were some of the major problems suggested by various organizations and selected leaders in the field of industrial arts.

It seems to us that one of the best ways to improve industrial arts is through the discussion of these problems at the local and State levels. These are the problems and issues to which the professionals in the field of industrial arts must find answers. It is through the involvement of various individuals and State groups, working singly or together, that these problems can be clarified and direction given to industrial arts. This, by the way, was one of the recommendations that came out of the conference in Washington, and we are all looking forward to the written report.

Specifically, it seems to me that industrial arts can strengthen its position in the high school program by more accurately reflecting our changing technology. Industrial arts should become more closely connected with the major problems of industry. New materials, new processes, new machines, and new products should be reflected in the school program. For example, the study and use of transistors in electricity and electronics or the processes used in bending plywood to form modern chairs would seem to be appropriate experiences reflecting changes in our technology. It is in programs where this has not taken place that industrial arts has fallen into disrepute.

Students who take industrial arts courses must be challenged to solve their own technical problems, and this increases their opportunity to become future engineers and scientists. What better opportunity is there for them to begin to experience problem solving than by using tools, materials, processes, and machines as a foundation for future study in science and technology? In today's world everyone needs technical understanding to cope intelligently with modern life; girls, as well as boys, should be given the opportunity to experience industrial arts. ◀

Mrs. James C. Parker
President, National Congress of Parents and Teachers

in an age of industry and technology: "improvement and re-direction"

Thoughtful educators in these days are making critical assessments of school offerings. This is right and good as those of us who have watched its progress will agree. We hope, with a faint sense of uncertainty, that there will be strength enough to withstand uninformed onslaughts and firmly stand by those developments which have brought opportunity and training to students of differing abilities, talents, and backgrounds.

Industrial arts and its partner but not twin, vocational education, may well be surveyed in careful analysis of their place in this current effort to define education fitted to our day.

Surely no one can think in an age of industry and technology when nearly half of our high school graduates go into trade and service occupations that those aspects of secondary school curriculum should be abandoned. Rather, it would seem, they should be improved and directed into broadened concepts which will bring realization to students of the place which business and industry hold in the pattern of our living. Through them, boys and girls begin some personal experience in those skills and knowledge which may later either help them to earn a living or have application in their lives as individual citizens rather than working men and women. In an age when leisure time grows ever greater, surely an understanding of tools, materials, and craftsmanship are logical phases of learning for young people. ◀

Industrial arts at the crossroads! In the post-Sputnik turmoil among various areas of the curriculum, industrial arts has been grouped all too frequently with subjects which must "give" for a greater emphasis on science, mathematics, and languages. Since these "solids" have been undergoing significant improvements in course content, presentational techniques, etc., are **there directions which industrial arts should take to upgrade itself to maintain and heighten its value in the program of the American high school?** How can industrial arts keep in stride with a curriculum revitalized for our technological space age?

As guides to a mold in which to cast a new image of industrial arts, we've asked **representatives of several key influences in education immediately outside the field of industrial education to suggest these directions.**

W. A. Shannon
Executive Director, National School Boards Association

"a question of how much time . . . and money"

The real issue is not whether boys and girls should have some industrial arts experience in the schools. It is, rather, a question of how much time should be devoted to it and how much money should be invested in it. Many educational leaders feel strongly that industrial arts has not found its proper place in the school, due largely to the way it, as a phase of industrial education, is financed and managed.

Because industrial training, generally, receives federal support, we find undue emphasis placed on it, regardless of the need. There has been full-time vocational teaching in communities where the high schools were so small that a full-time teaching program could not be justified. Furthermore, vocational training teachers are not permitted to work on a part-time basis, or to teach in more than one field. This is a result of the impetus of federal support and control from Washington and the state capitols.

It is proposed, in order to make a more meaningful place for vocational training in the school program:

1. That emphasis should be placed on providing a basic course in home economics (in addition to the sixteen Carnegie Units required for graduation) for each high school age girl who is college bound.

2. That each boy in Junior High School be given a minimum of one period each day for six weeks to learn the use of tools and respect for those who work with their hands to earn a living.

3. That opportunities be provided in the comprehensive and technical high schools for students with special aptitudes in the vocational fields, and for those who are making high school the terminal point in their formal education, to help prepare them for future job opportunities. ◀

Benjamin C. Willis
President-Elect, American Association of School Administrators; Superintendent of Schools, Chicago

"a sequential development content" is needed

The goal of education is to provide the challenges and opportunities essential to the maximum development of the potentials of every individual. This applies to industrial arts just as it does to other areas of the curriculum. Provision for individual differences requires a variation in content — both in breadth and depth — and in instructional procedures. Grouping and/or sub-grouping of pupils to assist in meeting the needs of the individual are essential.

Increasing technology has far-reaching implications for the content, materials, and processes of industrial arts. A knowledge of the strengths and weaknesses as well as the special properties of modern-day materials is of great value of the future scientist and engineer, to the industrial designer, and at varying depths to a great many others. A knowledge of the processes does more than give information about various occupations, it helps create a genuine appreciation of the culture in which we live.

Increasingly, industrial arts is beginning in grade 7 and is being required of every boy, as a part of his general education throughout grades 7 and 8. When such studies are continued in grades 9 through 12, there must be a sequential development of content in each of the industrial arts areas. Curriculum materials in any area can be exploratory only for a limited time, then exploration must be replaced by study of increased depth. The curriculum area of industrial arts is no exception.

In a world in which rapid change due to scientific discoveries and technological progress is accepted as the mode, all areas of the curriculum must be subjected to planned and continuing evaluation. Such evaluation must be related to the individual and the nature and needs of the society in which he lives. In the United States that includes the occupational needs and daily living needs of the individual in an industrial and a dominantly urban culture.

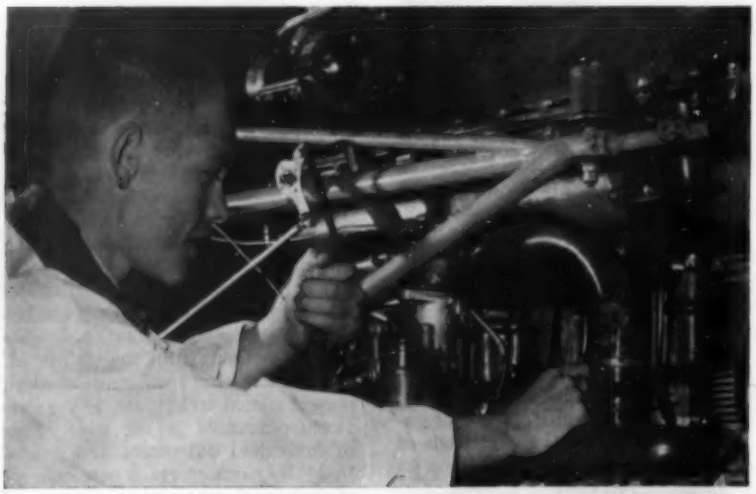
Teachers who are keenly aware of and informed about current developments, who have a background of considerable depth and breadth, and who keep abreast of instructional techniques and procedures are key factors in maintaining and strengthening the industrial arts programs. Team teaching, television teaching, and the use of teaching machines all have important implications for industrial arts instruction. A film of a demonstration by a master teacher of the use of certain tools or a film of a process can be shown to the class or viewed over and over for a specific need by an individual. A teaching tape developed for a definite purpose, or a set of slides, may be the answer.

The administrator of vision utilizing the special talents of each teacher through modern organizational practices, together with the informed, creative teacher utilizing modern presentational techniques, and a curriculum adapted to the wide range of individual differences and geared to 1960 — can create a new concept of industrial arts education. ◀

what is ahead NATIONALLY for vocational education

LANE C. ASH

- Changing **social and economic elements** of our civilization have implications for vocational education in the years ahead.
- Here is **an analysis of trends in vocational education** caused by these new emphases.



— Harry Goldstein

The controlling purpose of vocational education is to fit persons for useful employment.

The federal-state program for the promotion of vocational education, embodied in the Smith-Hughes Act of 1917, is based upon two fundamentals: (1) that vocational education is in the national interest and is essential to the national welfare; and (2) that federal funds are necessary to stimulate and assist the states in making adequate provisions for such education. That Act, and subsequent legislation, provided authority for the appropriation of federal funds to assist the states to meet the needs of those who have entered upon, and those who are preparing to enter upon, the work of various occupations in the fields of agriculture, distribution, homemaking, trades and industry, practical nursing, and as highly skilled technicians.

Vocational education provides training for young persons in regular day secondary schools and for out-of-school youth and adults both employed and temporarily unemployed in classes held at the time of day or night when these students are able

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to attend. It is an important part of a well-balanced school program aimed at developing competent workers and recognizing that the American worker should also be competent economically, socially, emotionally, physically, intellectually, and in a civic sense.

An important study of the need for vocational education reported among its findings that "While many different kinds and grades of vocational education will always be required, the kind most regularly demanded at the present time is that which will prepare workers for the more common occupations in which the great mass of our people find useful employment.

"There is a great and crying need of providing vocational education of this character for every part of the United States — to conserve and develop our resources; to promote a more productive and prosperous agriculture; to prevent the waste of human labor; to supplement apprenticeship; to increase the wage-earning power of our productive workers; to meet the increasing demand for trained workers; to offset the increased cost of living. Vocational education is therefore needed as a wise business investment for this Nation, because our national prosperity and happiness are at stake and our position in the markets of the world cannot otherwise be maintained."

While this expression of need might be written today, it is quoted from the report dated June 1, 1914, of the commission created by Congress to consider the subject of national aid for vocational education. Since that time, many social and economic changes have occurred in this country. As a result there is not only an increased need for vocational education but the necessity to create new patterns in programs for the preparation of people for useful employment which are consonant with the changing times.

It is obvious that our civilization's social and economic changes have implications for programs of vocational education, as they do for all education.

Particularly important is the speed of change in events today. The results of some of these changes are evident; there are many however, which have yet to make their impact felt upon society. Some of our practices in vocational education are preserved because they worked satisfactorily in the past. They have been based upon situations which existed long ago; they ignore current changes. We continue to teach some of the same subject matter by the same methods and with the same objectives as were pursued many years ago when the needs of individuals and the national economy were quite different from those of today. Inquiry into some of these and other traditional practices should be made to test their efficacy. This would suggest the need for studies and research to determine best practices in vocational education.

The Need for Research

The importance of research to obtain facts upon which decisions may be based in vocational education cannot be underestimated. Many things are taken for granted; for example, one might easily conclude on the basis of general information at hand about farming that too many young people are now preparing for life on the farm in our vocational agriculture education programs. However, studies have shown that this is not generally so in all areas. In one state recently the number of graduates in vocational agriculture equaled less than 57 per cent of the estimated annual replacement needs for farm operators. In another state, studies showed that the graduates equaled about 65 per cent of estimated replacement needs. In some sections of a state there was an excessive number of students pursuing vocational agriculture while in other farming sections of the state there were relatively few students taking such courses.

social and economic changes affecting vocational education

population

number of people way up, altered relative size of age groups with more workers under 25, increased number of women, shift from rural areas;

productivity

more machines with finer automatic controls, more people producing services than goods, decentralized industry, greater mechanization of farms;

labor

greater need for workers with more training and education, less need for unskilled labor.

Specialists in home economics have been asking themselves some basic questions as they study issues facing them today. Examples are: Is home economics necessary in the basic education for all youth? Should programs in home economics education place emphasis on principles of management and human relationships with a corresponding de-emphasis upon manipulative skills as ends in themselves?

Much of the research done in industrial education has been applied, rather than fundamental or pure research. There has been little experimental research under controlled conditions. Meager attention has been paid to research in the basic sciences and disciplines that underlie industrial education, such as in the psychology of learning. Much of what has been done along these lines is local in character. There has been little co-operative research in which two or more states have gotten together on a common research task. In addition, a considerable amount of research findings remains unpublished. Many of the research studies which have been done in industrial education have grown out of the requirements for graduate degrees and the topics selected for these investigations frequently are adapted to the degree attainment objective rather than the solution of any regional or national problem.

In the field of trade and industrial education, research is needed in almost every aspect of this work and the range of possible research projects is great. Just a few questions illustrate some areas deserving of inquiry: How do persons learn specific manipulative and technical skills? What is the effectiveness of specific instructional aids such as television, filmstrips, instruction sheets, workbooks, and the like? What are optimum teacher qualifications? How much and what types of professional education are really needed by shop teachers, and how much and what kind of practical experience is absolutely required?

Opportunities to conduct research were never so great as at the present time. There has been a great upsurge of interest in business and in government. In the field of education, the Congress has provided generously for co-operative research projects conducted under authority granted to the Office of Education in P. L. 531. In addition, many of the states are finding it is possible with funds already available to plan and conduct studies and to do research on pressing problems which are before them at this time. The great urgency to

vocational education in the years ahead: enlargement of occupational information and guidance services, later placement of vocational courses, higher quality of programs, developed agency co-operation, manpower re-education . . .

— Milwaukee Vocational School

meet changing national needs requires that the facts be obtained as a basis for improving systems of education in this country.

Some Trends in Vocational Education

It is likely that the growing national needs for occupational competence in the next decade will be served by vocational education having changed emphases and new program directions.

Continuing appraisals of conditions and practices in vocational education will result in designs for new and better ways to identify problems and to formulate solutions to them. Some outstanding survey reports by the states and higher education institutions now point the way to improved survey techniques which may be used by educational authorities for effective program planning and co-ordination.

The Congress has declared that the security of the nation requires the fullest development of the mental resources and technical skills of its young men and women. Of necessity in the fulfillment of this requirement is the enlargement of occupational information and guidance services. These will be extended and improved both to make them available to more students and to assure better preparation of counselors who assist students to make wise occupational choices. Counselors will have functional knowledge and understandings of the advantages and shortcomings of work and life in the fields for which the schools offer preparatory and extension courses in vocational education. This will be assured not only by the provisions of the National Defense Education Act but by the growing recognition of counseling as a necessary function of the educational system.

There are signs which point to the placement of vocational courses in later grades in the secondary school and even beyond. The expanding fund of knowledge which is necessary just for successful citizenship in a post-mid-twentieth-century democracy requires an increasingly long period of general education. This tends to crowd out of the early secondary school years courses which emphasize preparation for work. As jobs become more complex, the theoretical content will be greater and on a higher intellectual level. Courses which provide the "know-why" about some occupations such as mathematics, the physical sciences, and related technical information, will be of a higher order and they will require prerequisite study to the extent they likely will not be offered below the upper secondary grades.

The greater complexity of occupations in the future and the increased responsibility of individual workers in them will require that school programs have a superior intellectual quality. The cost of mistakes at work due to lack of knowledge or ability will be very great. It is probable, therefore, that vocational courses will be characterized by increased intellectual "toughness" in their content. The need for highly skilled technicians will increase. More and more programs of vocational education will be planned to accommodate this need in the fields of agriculture and distribution in addition to research and development and production, both at the secondary and postsecondary terminal levels. All of these things indicate the likelihood of higher entrance standards or improved criteria for the selection of students who would be admitted to many vocational courses as well as their placement in higher grades than now.

Agency Co-operation

The national need for the development of each person to his optimum capacity for successful achievement and to lead a satisfying life demands the co-operation of all agencies concerned with this process. There will be closer co-ordination of effort among school authorities, employers, organizations of employees, and agencies of government such as the employment services, departments of labor, and others in the interest of the most effective program development. It follows then that programs of vocational education will profit by greater use of consultative committees which will include in their membership personnel outside the field of education who have an interest in human development and the needs of the community.

Depressed urban areas and centers of rural underdevelopment present problems which affect a surprisingly high percentage of youth who are neither in school nor productively employed. For many of them no adequate provisions exist for training for initial employment or for progress in their chosen occupation. Some migrate to centers where they are in competition for jobs with youth who have had vocational training in school. Solutions to these problems will be of several kinds in addition to those which may be provided by any special federal and state legislation that authorizes aid to these areas. The larger unit of school administration, as for example the area vocational school, will provide help in some regions. The number of comprehensive high schools will increase to provide more curriculum choices by students.

Closer co-ordination of effort among the several services in vocational education will provide service to students in other regions. This would be exemplified by combinations of courses offered in vocational agriculture and distributive education, or by agriculture and vocational trade and industrial education depending on the needs of the people in the areas concerned in relation to employment opportunities available to them. The large number of part-time farmers would suggest one group who have need for such improved professional co-operation. Ways will be discovered to prepare youth for employment in occupations related to agriculture enlisting the services of occupationally competent instructional staff for teaching and co-ordination of school and work programs. The training needs of those who have migrated from rural to urban centers will continue to receive greater attention and vocational education will share a larger responsibility in the

(Concluded on page 60)

The Challenge of Small Schools to Industrial Educators

TEACHER "X"

"The visions of teaching were rosy as I left college," Teacher "X" began in a letter to the editor of IA/VE, "but I found later that these roses also had a few thorns in with them." In the following statement **he describes these thorns and how he handled them** as a contribution "dedicated to the problems a new (and sometimes, an experienced) teacher is apt to face in a small district . . . which still have schools and need good teachers."

An industrial educator upon leaving college finds in a large school system that he is more or less specialized in a particular area such as drafting or woodwork, but in a small district he finds an entirely different situation. He will probably be the only "shop man" with the entire industrial education program in his hands — and with additional duties besides.

Many teachers like myself prefer a small town but, unfortunately, many of America's small towns are "has-beens." Their boom days are long gone. They still have schools, however, and still need good teachers just as large cities do. These small schools have advantages in teaching, such as excellent student-teacher relationships; the one big disadvantage is the lack of financial resources. Taxes are low and costs are high. New teachers are apt to become discouraged at the many problems they face.

In addition, industrial arts poses a particular problem because of expensive equipment and supplies. Many schools close their shops due to lack of funds. Thank God for those who don't! All students need industrial arts in our ultraindustrialized, space-age society.

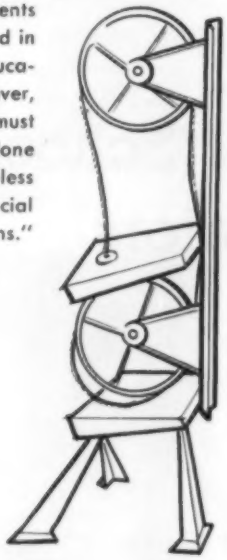
How to Meet the Challenge

The solution to financial difficulties in industrial arts for smaller communities is not to discontinue the program, but to innovate, when at all possible, answers to equipment and supply obstacles.

When I first arrived here I found the shop in pretty sad shape. Even the color — everything was gray — made the shop look sad. The major equipment — lathes, the planer, and the table saw — either worked improperly or not at all. A few "home shop"-size machines had been added indiscriminately through the years to replace some of the original (the school was built in 1919) equipment.

Nobody can have been more discouraged than I. Electric motors ran erratically. Bench tops were loose and marked up. Vises were either loose, broken, or missing. There were no texts

"The major equipment . . . either worked improperly or not at all . . . When students are interested in industrial education, however, something must be done regardless of financial restrictions."



copyrighted after 1921. And the lighting was poor.

When students are interested in industrial education, however, something must be done regardless of financial restrictions: this was the thought in mind during the following months.

Renovating the Equipment

I proposed a plan of action to my superintendent and he approved. He told me that if I need help he would do all he could.

I know that we couldn't get new machines but we could make the old ones look and run like new. I took every motor in the school apart, cleaned out the dust and grime, replaced bearings, switches, cords, and brushes which were needed until they were all running smoothly. I junked the old flat-belt drives and replaced with more efficient V-belt units. I shimmed machine bearings and thoroughly lubricated everything that needed it. A little diplomacy paid off when the filer at the local mill sharpened the planer and jointer blades as well as every saw in the shop.

When school opened, a lot of work remained to be done. My boys wanted to make the shop "look like something" and they volunteered to work in shifts after hours. We put color dynamics to work. Before long, all machines were painted green, the safety zones surrounding the machines yellow, and the controls red. This made an astounding difference in atmosphere.

We fixed up a separate finishing room, remodeled the tool crib, installed new electrical outlets, made drafting boards from ¾-in. plywood and desk tops and T squares from ¼-in. plywood and maple. We borrowed a portable belt sander, worked the bench tops smooth, and varnished them. A mechanic in town offered his arc welder to repair the vises.

I can't tell you how proud I was of my boys and what they had done. And they were proud of their shop.

We still keep a regular maintenance and improvement program through a student personnel organization plan. Each week a different pupil is assigned to lubricating the machines. Other students act as foremen, sweepers, lumber suppliers, finishing room and tool crib supervisors, etc. The last week of each school year is usually reserved for refinishing benches.

Solving the Supply Problem

Supply is always a big problem. You want quality materials but they cost more.

Fortunately, lumber is easily obtainable from the town mill. More than once, I went to pick out what I needed and they donated the entire order. Pine, basswood, cherry, maple, and birch are locally abundant. Cabinet woods, such as walnut and mahogany, are ordered only when needed.

At the beginning of each semester, I sell a $2 material ticket to each student to provide immediate cash for supplies. This money supplements, not replaces, the general shop budget.

The government surplus depots scattered across the country are often a source for drafting instruments, hand drills, bits, pliers, screw drivers, and other odds and ends. In this case, it's a matter of your superintendent being at the right place at the right time. The only work involved is removing the cosmolene and repainting the handles.

Expendable items, such as glue, screws, and finishing supplies, should be ordered in advance from the general fund.

A good public relations program can work wonders in obtaining additional funds and equipment. People in small towns are very aware of their school activities. Before long, everyone will know you and what you're doing even if you don't know them. The best messengers are your own students. Displays of the students' quality work reflect good course content. Architectural drawing projects, combined with carpentry course models and furniture displays emphasize the practical angle. Especially in small towns do beginning students (and their parents) like to show off handiwork — and this can be a good start to keep interested in industrial arts throughout their lives.

With no texts available, I developed a library of my own to which I constantly add current material. Subscriptions to good periodicals and trade magazines are wise investments, since they provide a supply of project material and helpful hints. I use all this material in preparing mimeographed information and operation sheets as well as bulletin-board items.

Since industrial education should not consist of snap courses, I try to keep standards high, require plenty of outside work and oral and written reports, and guarantee frequent tests.

On Courses and Content

Course content is important. How are you going to conduct space-age industrial education classes with only a woodshop (while Russia probably has space station construction courses at the junior high school level)? but you have your imagination, education and theories, and access to the finest printed material. Maybe you won't have enough text material for every student, but you can convey to them the information available. Promote creative thinking and design; expansion of your drafting program gives an excellent chance for this.

For the first year I offered only courses in woodwork, but I didn't think it was enough so I upgraded and broadened the selection of courses. Planning a modern, detailed course of study is essential, as revising it frequently. Good unit and daily lesson plans keep things moving smoothly. Demonstrations are effective only if they are planned, rehearsed, and are well timed — long enough for complete coverage and are short enough to retain interest. Films and filmstrips, are valuable aids.

I alternate courses from year to year to give the best possible coverage without repetition because two grades are often combined. Presently the courses in the first year include: grades 7 and 8, *beginning drafting* (1st semester) and *elementary woodwork* (2nd); grade 9, *bench woodwork* (1st and 2nd); grades 11 and 12, *architectural drawing and design* (1st) and *carpentry* (2nd). In the second year, they include: grades 7 and 8, *general shop* (1st semester) and *shop mathematics* (2nd); grades 9, *engineering drawing* (1st and 2nd); grades 11 and 12, *advanced woodwork and furniture making* (1st only).

Presenting subject matter in a small school district requires more time and effort on the teacher's part. But when you know your students are retaining the knowledge gained and can put it to use in today's world, you know your efforts weren't wasted and you have done your best to meet the challenge. ◀

On Classroom Control

— Harry Goldstein

WALTER TRASIN

- The "group spirit," or the real environment of your classes, is the "key which can unlock the door to a favorable learning situation."
- Here are clues on how you can create a pattern for a wholesome group spirit for more effective teaching-learning during the coming year, with special attention to how to deal with "disruptive forces."

During the opening days of school you are busy with the mechanics of getting your class started. You assign seats, issue lockers, introduce course content and procedure, read aloud the general information bulletins, and follow up with various other necessary activities. Meanwhile, you are beginning to form an association between the names and faces of the strangers who are gathered before you.

The Classroom Environment

Long before this first day, you have determined to create a classroom environment which would be favorable to learning. You are aware of the needs for adequate lighting, ventilation, work space, etc., and have made provision for them. On the bulletin boards are your most interesting displays. You have spent many hours planning for suitable supplies and equipment, and you have revitalized the content of your course. These are the standard requirements for a favorable learning situation. Yet, in the back of your mind there is a persistent awareness that the really important elements in the environment of any classroom are the students themselves and the teacher.

As you stand before your class on these first days, you see an assembly of individuals — not a group or cohesive unit — but you know that a change will soon take place. You know that whenever young people are brought together for a considerable length of time, leaders will develop among them and a set of values will evolve, a kind of group spirit. This development will occur whether you want it or not; you cannot stop it, nor would you want to, but you can influence the direction it takes. The spirit of the group can either aid or thwart your teaching efforts. This group spirit, then, is the real classroom environment. It is the key which can unlock the door to a favorable learning situation. And so it is with deep interest that you watch the development of your classroom society and give pattern and direction to its growth.

The First Moments

You observe your students as they enter the classrom for the first time.

Mr. Trasin is an instructor of industrial arts with the Montebello, Calif., Unified School District.

Most of them appear to be strangers to each other, or perhaps casual acquaintances. Pete Smith is one of them. He looks around for familiar faces as he enters, finds a place to sit, says a few words to a neighbor.

After the long summer, Pete is glad to be back in school and is looking forward to new experiences. Almost at once, he begins to make judgments of you, the teacher, and of his classmates. He wonders, "Where will I fit in?" Pete may spend many class hours working out the answer to this question.

While he listens to you, Pete observes the activities of his fellow students. Out of the corner of his eye, he sees Don poke an elbow into another boy's ribs and watches expectantly for the return blow, at the same time noting your reaction, if any. Don is an advance scout, exploring the limits of safe action in this new situation. By his actions, he is establishing a reputation for daring. If he is successful, Pete may be ready to follow him.

From the back of the room comes a question, foolish, but apparently sincere. Immediately Don blurts out, "What a stupid guy!" The class roars with laughter and Pete watches to see whether you will join in. The boy in the back does not ask another question. Pete, also, has a question, but he hesitates to risk group ridicule and decides, therefore, to let it go unanswered. He is feeling the impact of the developing classroom group, the most powerful influence on his thoughts and actions.

Giving Direction

How can you give direction to this classroom society? As a teacher, you are actually not a member of the group. Your position is similar to that of a territorial governor who is appointed by, and responsible to, an outside power. Within the classroom, however,

your authority is practically unlimited. In all activities, you have the power to define and set the limits of action. This is considered to be not only your right, but your responsibility. Students expect you to exercise this responsibility.

One such responsibility is that of setting the limits of acceptable behavior in the classroom. The methods used by any particular teacher would fall somewhere along the scale "democratic-autocratic," depending on his personality as well as his point of view and training. One teacher might put a list of "rules" on the bulletin board and say, "This is what we do here." Another, with the help of the students, might develop a "code of behavior." A third might state the problem and leave its solution entirely up to the students, with the understanding that should they fail to meet their responsibility, the matter will be taken out of their hands. Although one approach might be considered to be more effective than another, any one of them might work, provided that the definition of the situation is clear and the follow-up is consistent. Vagueness and inconsistency leads to confusion. Failure to establish the boundaries of acceptable behavior leads to chaos, even panic in extreme cases, as students become frightened by their own unbridled actions. This is not to say that students will always agree with limits on their actions. On the contrary, they may be continually testing these boundaries, yet in doing so, they are verifying the existence of the limits and the corresponding areas of safety and order.

When Don ridicules another student, he is clearly making a bid for leadership and the response of the group (laughter) indicates at least tentative acceptance of him in this role. By this time you are aware that he is a potential leader, and you know that if you do not give him opportunities for leadership, he will create his own. In fact, he might prefer it that way. Clearly, this is a point of decision, and the decision is up to you. The rest of the class will watch closely for your reaction. If you ignore the incident, it is taken as a sign of mild approval, both of Don personally and of ridicule as an acceptable instrument of control. If you show open approval, ridicule may set the tone for future class activities, dampening honest inquiry. (In the eyes of the group, however, Don may become suspect as a tool of the teacher.) If, on the other hand, you firmly disapprove of ridicule, it is clearly beyond the bounds of acceptable behavior, although, of course, it is subject to further testing by the students.

Creating a Pattern

By a chain of such small, almost insignificant, decisions a pattern is created which in time will dominate the classroom environment, facilitating or disrupting the process of learning. Actively or by default, you will influence the spirit of your class. If this spirit is to be a positive one, you need to have, first of all, a clear picture of the kind of environment which you want to establish, and secondly, you need to communicate this picture effectively and consistently to your students through all your actions. The classroom which encourages respect and fair treatment, provides a favorable environment in which students can work and learn. Your guidance is the determining factor in this development.

During the weeks that follow, you feel that your class is making progress. They come into the room in an orderly way and are soon ready for work. During instruction periods they are attentive, and in the discussions which follow, most of them show respect for the opinions of others. The work in the shop proceeds without unnecessary disturbance and the students assume their responsibilities in classroom and shop.

Dealing With Disruptive Forces

A pattern of control which is reasonable and is consistently applied, and which is accepted by the students as reasonable and necessary, will develop a momentum of its own. It becomes the "natural" way of behaving in your class. Yet, within your group there may be some disruptive forces, students who for one reason or another are in open or subtle rebellion. There is no formula for the solution of such problems; each is unique. In most cases, however, your first step is to talk with the student privately in order to understand just what the problem is, and especially to try to get his point of view and feelings in the matter. When you do so, you may find that the problem is the result of poor communication between the student and yourself, or a misunderstanding which can be corrected. On the other hand, you may learn that his behavior is an expression of deeper personal problems which he is attempting to work out. You may be able to help him, or you might decide to refer him to other staff members for aid.

Don has continued to be a disruptive element in your group. While the class is studying an assignment, he will suddenly begin to whistle, causing others to look up from their work and inspiring a few half-hearted imitators. You glare at him and he subsides, but after awhile he begins to whisper loudly to a neighbor. During class discussions, he will invariably try to be the first to state his opinion on any matter.

You ask yourself, "What does he get out of it?" It is obvious that he gets a lot of attention, both from you and from the group. You could try withholding all attention. Ignore him, and see what happens, or you could try the opposite; find ways to give him the recognition he is struggling to obtain. You suspect, however, that he is not striving for your attention. He wants to be recognized by the group.

You have noticed that he has few friends and is not well liked by most of the students. This is a good lead to follow up. What could you do that would make this boy more acceptable to his group? Obviously, the worst thing would be to give him a position of authority over them; this would only increase the distance between them. On the other hand, if he could help the others and yet have no authority over them, having perhaps some special skill which he could teach the others, the relationship might change. And so you try to provide opportunities for him to increase his skill and knowledge, and encourage him to teach others, all of this done with discretion. When you see definite improvement in his behavior, you know you are on the right track. You do not expect 100 per cent change. Learning is a slow process; it is the direction of change that is important.

Special Attention Needed

Another of your students is calling for special attention, but for another reason. Ed started the class with great enthusiasm, but lately he appears to have become withdrawn, almost surly.

You tell him that you would like to talk with him after school, in private. "Which would be better for you — this afternoon or tomorrow?"

He avoids meeting your eyes and replies, "I can't come in today."

"Then tomorrow. OK?"

He nods agreement. At the appointed time he is in your office, sullen and suspicious. After some probing he opens up and blurts out his grievance. He feels you have treated him unfairly, and he cites an incident which makes out a pretty good case for him. You only vaguely remember the incident — it had to do with suspected dishonesty during a test — but from his account it seems you were indeed high-handed. In his voice and in his eyes you recognize the bitterness of injustice.

After you have heard him out, you say, "Ed, I've made some big mistakes in my life and it looks like this is one of them. Let's see if we can square things up." From that moment, Ed is a boy with whom you can work again.

In some cases you might find that the student is actually challenging you in a bold struggle for power. He wants to show that he is the stronger. He may be directing his battle against you, personally, for control of the group, or his behavior might be an expression of

rebellion against adults in general, particularly those who represent authority.

During his talk with you, the student may begin to understand the causes of his behavior. If he achieves this insight, and is able to express it, he may find that he can abandon the undesirable behavior and adopt other means of reaching his goal, or he may find that the former goal is no longer important to him, once he has examined it closely. A sense of fairness on your part, and an honest attempt to understand the point of view of the student, will go a long way toward solving most of the student problems which you will encounter.

The Last Resort

There may be some students, however, whom you will be unable to reach, just as there are some problems for which there are no available solutions. After you have used all your own resources, and those of the staff, if the situation is such that the student continually disrupts the stability of your group, you will ask to have him removed. An experienced administrator will support your decision, since he knows that you have a responsibility to all of your students to establish and maintain a favorable environment for learning. It is true that one bad apple can spoil a barrel.

Yet, this is a difficult step to take. In the first place, it is an admission that you have failed. This is a matter of personal pride and need not be given serious thought. More important is the fact that removal of the student has solved your problem, but not his. This thought will continue to trouble you, and may, in the future, lead you to further understanding of the problems of some of your students.

In the meantime, Pete Smith has concluded that it is safe for him to express opinions in this class without suffering embarrassment. He has many sound ideas to contribute to the group, and he has an ability to dig quickly to the core of the subject matter which the class is studying. By his questions and interpretations, he clarifies the material for the other students. They respect him for this ability, thus, in this area of activities he is a leader.

Pete has found his place in the group. This development has been made possible by a favorable classroom environment, and Pete's contribution, in turn, stimulates further learning by his classmates. Under a different set of circumstances, Pete might have been considered "square." In that case he would quickly have been discouraged from such activities, for his greatest efforts are directed toward finding his place in the group. This is true, also, for each of the other members of your class. ◀

▶ All about the "most valuable teaching device" an industrial arts teacher has —

How to Give a Demonstration

EDWARD J. BERGER

The demonstration is the most valuable teaching device the industrial arts teacher has at his command. This is the most efficient method of teaching the mechanical operations in the field of industrial arts. The well-organized, skillfully presented demonstration lesson will stimulate the pupils' senses of sight, hearing, touch, and smell; motivating him with a desire to practice and perfect the work presented. The skillful demonstration will attract and hold the pupils' attention and interest because he is able to observe immediate progress as the result of his effort. Pupils readily learn from observation and imitation. A great deal of the success of the demonstration, in the learning process, depends upon this factor of imitation. The successful teacher will catch the imagination and intrigue the pupil; the skillful performance, with its satisfactory results, will build teacher prestige and stimulate the pupil to imitate his teacher.

The demonstration should be given only when it is needed. When it is given for any other reason it will fail and it will be more difficult for the teacher to regain his prestige when he attempts a later lesson. The demonstration is necessary whenever new operations are to be presented to the class. This may be at the beginning of the term, the starting of a new project, or it may be necessary for pupils, who because of absence or individual differences, need special assistance. The time for class demonstration should be selected with care. The early minutes of the period are usually best because the class is together and the pupils have not started anything which they would be reluctant to interrupt. Lessons given close to holiday seasons, vacations or athletic contests are certain to present problems involv-

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An important asset to your demonstration technique would be a "package" containing all the special tools, materials, prints, charts, and practice pieces used in the demonstration.

ing attention, interest, and memory. Those days, when the class will resent the fact that the demonstration made it impossible for them to work on their projects, will produce a negative attitude with little learning taking place.

The class demonstration, involving the entire group, is used to present core material — that is, operations which all of the pupils will be using. The small group and individual demonstrations are presented to one or more pupils who, because of absence or individual differences, need special help. The pupils requiring special help should receive the teacher's most patient, considerate attention. The pupils involved are usually the boys with outstanding ability, who are going ahead of the class, or the slow learners who have difficulty keeping up with the group. No amount of class demonstration will eliminate the need for individual teaching in the industrial arts program.

Analyzing the Demonstration

In the merchandising field a great deal of time, thought, and money are annually devoted to the study of demonstration methods and techniques. Every act and word are analyzed so the prospective buyer may be guided from one thought to the next with the sale as the final logical step. The industrial arts teacher will do well to devote considerable time and thought to preparation, presentation, and implementation of the demonstration.

Telling is not teaching and superior craftsmanship is not a guarantee of the ability to teach. Successful demonstrations evolve from an analysis of the problem, the organization of the teaching procedure, and an intimate knowledge of the need of the pupils. Before the lesson there must be a plan which includes the course of study, the weekly plan, and the lesson plan. The course of study acts as an over-all teacher guide; the weekly plan helps the teacher adjust his activities to the school calendar and to the progress of his pupils. The lesson plan is a detailed guide to the teacher as he teaches.

It is advisable for the teacher to go through the demonstration and practice in private to be certain of all of the details and to insure a smooth running, concise lesson before presenting it to the class. The teacher must work to perfect his methods and techniques, many of which are involved in the details of preparation, presentation, and craftsmanship. Many of the methods and techniques used may be classified as standard practice for all teachers. There are, however, many ideas and techniques which will work well with one teacher but which would not be suited to another. It is imperative that each teacher discover the techniques best suited to his personality and then exploit and develop them to the fullest possible extent. Details of preparation include:

1. All of the necessary tools and materials are to be on the demonstration bench before starting the lesson.
2. All of the necessary visual aids are to be displayed before starting.
3. Limit the size of the lesson unit to the fifteen minute time limit.
4. Check, adjust and set up all necessary machines before starting — perform all of the preliminary operations in advance of the lesson.
5. Demonstrate only to the pupils who are ready and who are aware of the need for the lesson. The teacher may have "to sell" the pupils the value of the demonstration early in the term.

It is most important for the teacher to get to know his pupils as early in the term as possible. It is difficult to teach efficiently when the teacher does not know the pupils by name and is not aware of their problems, aptitudes, and limitations. It is necessary then to become acquainted with the pupils, to establish rapport and to make the class feel at ease. This condition is relative but an effort early in the term, which grows as the term progresses, will do a great deal to insure more positive results from the class demonstration and *permit no distractions*. Explain the purpose of the lesson by asking certain pupils to assist or to take some small part. Pertinent questions, skillfully asked at the proper time, will prod the pupils to maintain a continuing state of concentration.

Presentation Techniques

To be successful the teacher must speak well, at the proper speed, using strong, firm, convincing tones which convey a feeling of importance for what is happening. It is suggested that the teacher begin with the voice volume slightly increased and later lower the volume and the tone to attract attention and to force the pupils to concentrate; therefore the teacher will be more successful if he is brief, clear, and concise, creating interest by means of activity, humor, and successful results. Never "drag in" unrelated material, the pupils will soon learn to exploit the story telling propensities of the teacher resulting in some entertainment satisfaction with little educational value.

It is essential that the pupils be given an example of accuracy with no excuses from the teacher for poor or incomplete work. It is apparent that all new terms are to be explained and only accepted trade practices are to be used in the lessons. The demonstration should be accessible to the pupils; it is unfortunate but many times the pupils are forced to follow a demonstration in reverse. Try, as far as possible, to have pupils see what is taking place just as the teacher sees and demonstrates it. This is very important and often quite difficult.

It is poor practice to demonstrate on the pupils' projects; the operations should be completed on new material used by the teacher for purposes of the lesson only. The operations should be made with the same tools which the pupils use (and the tools used by the pupils should be in first class condition).

Where to Demonstrate

Safety practices are to be stressed whenever possible. Review and repeat parts of the lesson when the response of the class indicates a need. Before completing the lesson, check the results of the demonstration by a series of pertinent questions followed by the immediate application of the operations learned. Any part of the shop may be used by the teacher for the demonstration purposes and because of the location of the machine tools may be presented where it is most practical. It is good practice, however, to develop an efficiently planned and well-organized area where most of the demonstrations may be presented. The equipment in this area is: (1) a demonstration bench, (2) adequate blackboard area, (3) adequate storage facilities for plans, charts, sample projects and other visual aids, and (4) adequate storage facilities for the "Package Demonstrations."

The demonstration bench should be located, with the proper lighting and pupil seating in mind, away from the pupil work area. This bench is designed for the teacher's use only and it is never to be counted as a pupil work station. The demonstration bench should be so organized and arranged that all the necessary tools, materials, plans, prints, and other visual aids are stored and ready for use at all times either in the bench or in close proximity to it.

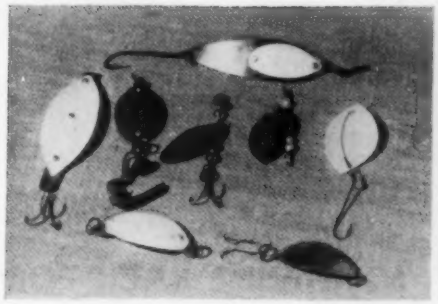
It will require a great deal of time and thought, to develop a demonstration bench and it will require constant care to maintain it. But the efficiency which it makes possible more than compensates for the effort. For each demonstration there should be developed a folio containing the lesson plan, a list of all tools and materials needed, and other visual aids and pertinent materials.

Try a Package

A "demonstration package," is composed of all the special tools, the materials, prints, charts and practice pieces which will be used during the lesson stored in a container. There are many demonstrations which make use of identical tools and it would be impractical to supply duplicate tools for each package. The demonstration package should contain only the special tools and the materials should be very handy to the demonstration bench. The demonstration package makes it possible for the teacher to pick up a single container and have all of the special tools and materials, for a particular lesson, in his hand at once. This makes it unnecessary for the teacher to set up all of the details of the demonstration each time it is given resulting in a great saving of time and energy.

A demonstration package for the application of oil stains to various types of wood would include: (1) sandpaper (½.000). (2) steel wool (000), (3) ½-in. paint brush, (4) piece of cotton waste, (5) piece of cloth, (6) various types of oil stain, and (7) various samples of wood (½ by 2 by 6). ◀

projects



PUT FISHING IN THE CURRICULUM

LEON I. REISSMAN
Teacher, Industrial Arts
J.H.S. 12, New York City

To American men and boys alike, fishing holds a strong appeal. Using this popular sport as motivation, the shop teacher has a solid basis for a series of simple, interesting, creative, and inexpensive projects of educational value. The designing and construction of fish lures can be successfully introduced into the shop curriculum.

These projects lend themselves very easily to any one of several areas of the industrial arts curriculum: metal, plastics, arts and crafts, and general shop.

The spoon type lure is the most easily worked with the basic shop tools. This effective "fish getter" is nothing more than a piece of metal designed to attract fish by either a wobbling or a spinning motion. For materials, the scrap metal box will supply all that is necessary: brass, copper, German silver, and stainless steel.

The student is given the opportunity to design his own particular shape using graph paper and a French curve.

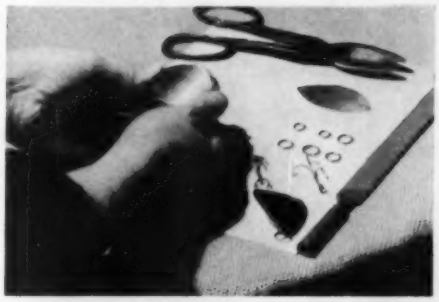
He then pastes his design on the piece of metal and proceeds as follows: (1) rough out the blank with a jewelers saw or heavy aviation snips depending upon the gauge of the metal, (2) file to the desired shape and size, (3) finish all edges with emery cloth and polish, buff or use crocus cloth, (4) drill small holes on either end and fit with split rings, and (5) bend and shape.

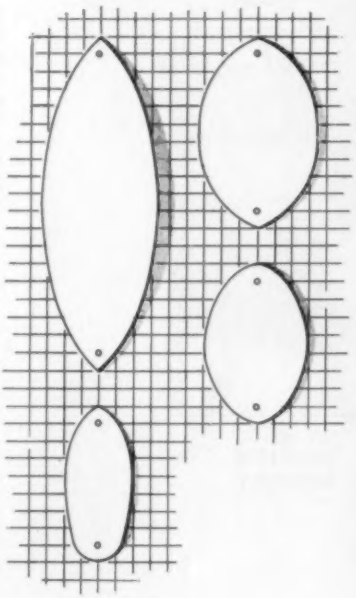
A treble hook goes into the back ring while the leader is attached to the other end.

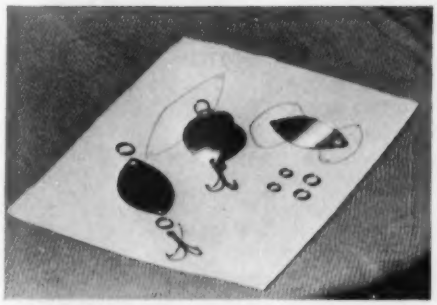
Experiment with designs until the action desired is obtained: spinning, wobbling, etc. The long shop sink filled with water can be used to test.

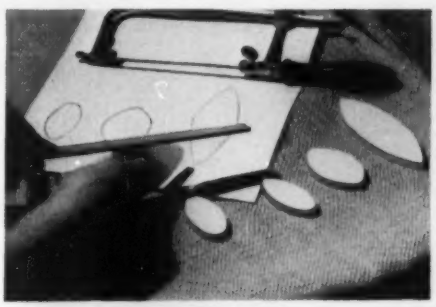
The student may leave the finished lure in its natural color — gold, silver or copper — or he may paint it with quick drying lacquer. Red and white stripes are probably the most popular combinations. However, other color combinations work in different parts of the country.

The same procedure as outlined above can be used in conjunction with other materials such as plastics, wood, and combinations of these.









MAGAZINE RACK FOR MASS PRODUCTION MASS PRODUCTION MASS PRODUCTION MASS PRODUCTION MASS PRODUCTION EXPERIENCE

BERNARD BERNSTEIN
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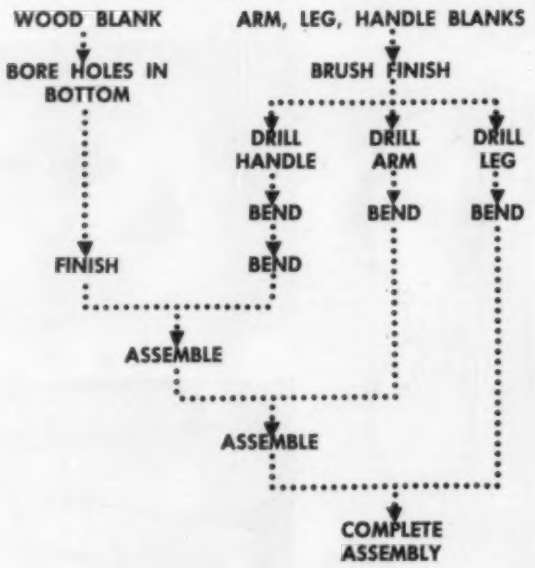
New Rochelle, N. Y.



One of the most frequently quoted objectives of industrial-arts education is that of bringing about in the student an understanding of industry. The school-shop production job, in which the class undertakes to mass-produce and sell a consumer product, is the most dynamic and effective technique yet devised for achieving the above objective.

A class which has organized itself for a mass-production experience will very soon be confronted with a problem which is quite similar to one with which industrial firms are faced — that of choosing and designing a suitable product. This is a desirable situation since the educational value of the school-shop experience will tend to be greater as it more closely parallels the approach, problems, materials, and processes of industry.

A mass-production project should, therefore, be designed so that it can be produced using as much as possible these characteristic industrial methods:

1. Automatic positioning and holding devices, such as jigs and fixtures for bending, drilling, cutting, assembling, etc.

2. Automatic stops to insure uniformity of bends, depth of holes, etc.

3. Elimination wherever possible of the need for evaluation, judgment, and decision-making by the worker on the assembly line.

There are three other factors which must be considered in addition to the one of adaptability of the project to mass-production techniques. These are: (1) appearance, (2) cost of production, and (3) adaptability to function.

Junior high school students have had little, if any experience along these

lines and the teacher can help a great deal by thinking through a project beforehand and presenting it for discussion and development. This gets the class over the first and most difficult hurdle.

One such project which has been developed is the magazine rack described in this article. Examination of the accompanying illustrations will show that it presents a neat, contemporary appearance, can be inexpensively produced, using either strip aluminum or iron, adequately performs its function of holding magazines, and is admirably suited to mass-production fabrication techniques. The project is complex enough and requires sufficient, separate operations to make full use of the manpower available in the average class.

All of the bending and drilling operations are accomplished through the use of jigs. The arms, legs, and handle are bent on easily made bending jigs which are equipped with stops. In this way all parts made on the same jig will be identical. In adjusting the bending jigs, allowance should be made for springback which will vary with the type, hardness, and dimension of the metal used.

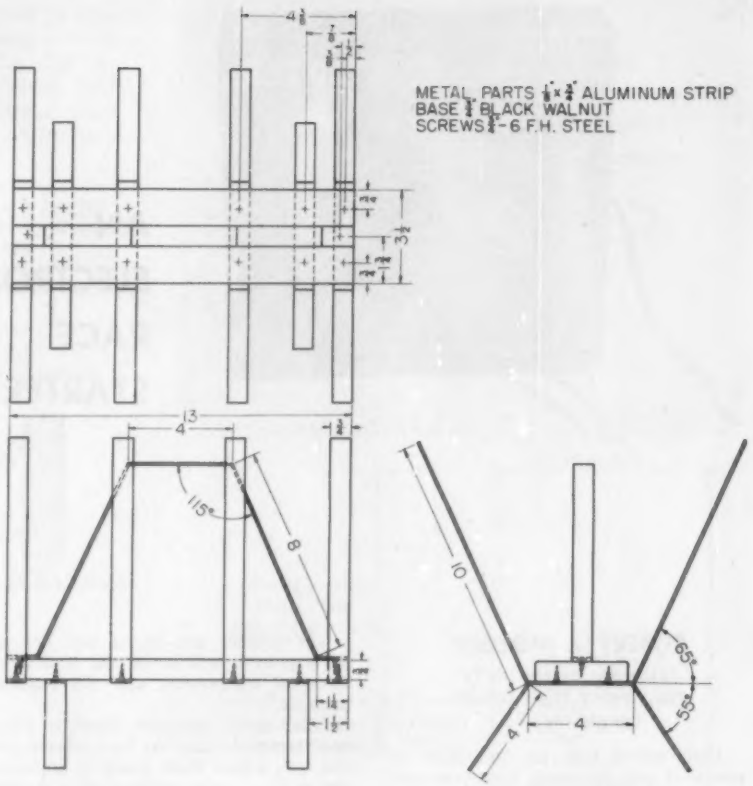
The holes may be drilled using jigs which will automatically position the material on the drill-press table. In some cases templates may be used to locate holes which may then be drilled with portable electric drills or hand drills. It would be advisable to do all drilling before any bending is done since this allows the operator to work with a straight strip and makes jig construction simpler.

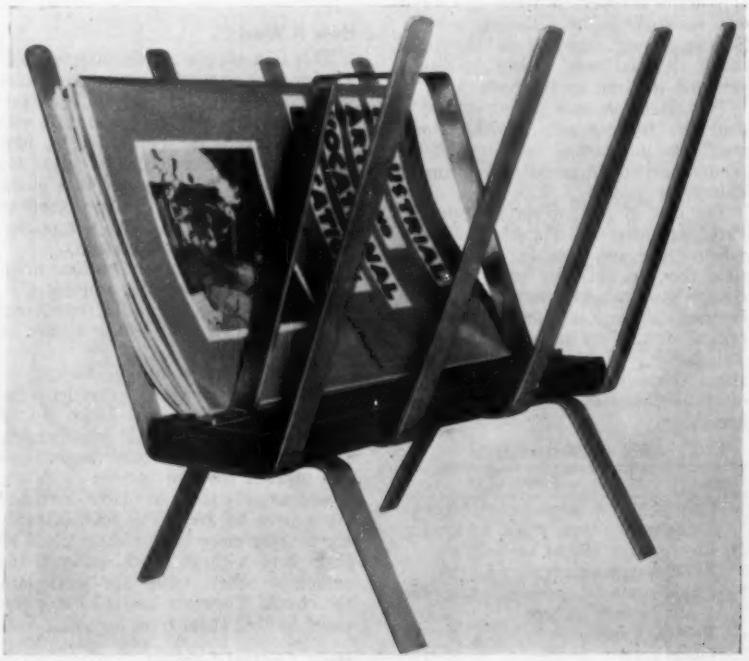
The type of wood used in the project will depend on the metal used. Black walnut was used in the prototype as it contrasts well with the silver color of aluminum. If wrought iron is used a hard light wood like maple or birch is recommended.

Lacquer or one of the quick-drying new finishes may be used on the wooden member. Flat black lacquer can be brushed or sprayed on the wrought iron.

For finishing aluminum, try rubbing the strips with fine emery cloth and then with steel wool. This gives the metal an attractive brushed finish. If a brass or steel-wire brush is available it can save considerable time in this operation.

One aspect of setting up the production run which is extremely fascinating and challenging is the manner in which the various parts of the project are routed through the work stations so that they meet at progressive stages of the assembly line without causing bottlenecks in the production. Unless every detail of the production is meticulously planned and carried out a situation will arise where some workers are standing idle while others will be swamped with work. The teacher should take advantage of these opportunities to relate the experience at hand with similar occurrences in the real industrial situation. No book or film could have as much meaningful impact on the student as the real experience of running off a mass-production project. ◀





AN ELECTRONIC RACE STARTER

ROBERT J. MOUSER
Instructor of Electricity
Neshaminy High School
Langhorne, Pa.

High school lads are interested in electrical and electronic apparatus and . . . they are especially interested when such a piece of equipment ties in with their sports activity.

A desire to combine these two interests resulted in the following project. Developed with the aid of the track coach, it has been highly successful and well received by the boys.

This electronic race starter is used to start the runners with an "Electronic gun." The gun cannot be "fired" if the runners are not in position or trying to "jump the gun."

The cost of the project is negligible. Parts are easy to obtain and many substitutions are possible, making possible the use of many parts that the electric-shop teacher may have at his disposal. Wiring is simple. The only critical part is the constant ring relay. This is the type that is used in burglar-alarm systems and can be obtained at most well-stocked electrical supply houses.

Bill of Materials

Quan.	*Parts*
1	Constant ring burglar-alarm relay (Edwards Type #26C or similar)
1	Low-voltage buzzer or bell
1	SPST toggle switch
5	Single contact phone jacks and plugs
1	6-volt lantern battery
4	Bell push buttons
	Lamp cord
	Necessary wood for cabinet or commercial cabinet (see text)

The cabinet can be of any design so long as it will house the necessary electrical components and will remain portable.

After actual practice, there is only one suggestion that has been offered by the high school track coach to improve the unit . . . the addition of a 6-volt light to enable the starter or "time man" to see, as well as hear, when the gun is "shot"!

How it Works

This is a simple circuit built around a relay that is used in a burglar-alarm circuit. This type of relay is one that locks in after it is energized and will remain locked in, permitting a bell or buzzer to sound until it is reset. All of the runners are connected in a series with the electronic starting gun (there is nothing more than a single-pole micro-switch housed in a wooden gun).

All of the track runner buttons must be depressed before the starting gun will cause the relay to be energized, lock in, and cause the bell or buzzer to sound until reset.

Since there must always be two to race, there are two jacks that have no jumper plugs for them. Jacks No. 3 and No. 4 can be used if four persons are to run a race. If only the original two persons run, the jumper cords are placed into the jacks to enable the starting gun to be fired. The jumper cords are nothing more than a short piece of lamp cord with the ends soldered together to short circuit the jacks into the circuit. They are knotted inside the panel to keep them from becoming lost.

Main Control Cabinet

This cabinet is made of wood. Size is not critical as long as the parts can be mounted. The battery (6-volt type) is housed inside the cabinet. It is suggested that this complete project can be built into a "suitcase-type" cabinet.

The Starting Gun

This gun is made from a piece of ¾-in. thick soft wood. The sides are made of masonite or hardboard. The gun has been copied from a 38-caliber revolver. Although a single-pole bell push button can be used, the author felt that the gun has more student appeal and is easier to handle on the track. (Note that the leaf of the micro-switch is used as the trigger.) The length of cord on the gun can be varied to suit the needs of the various tracks. A coat of jet-black paint is ideal for the gun. No parts of the gun nor sizes are critical.

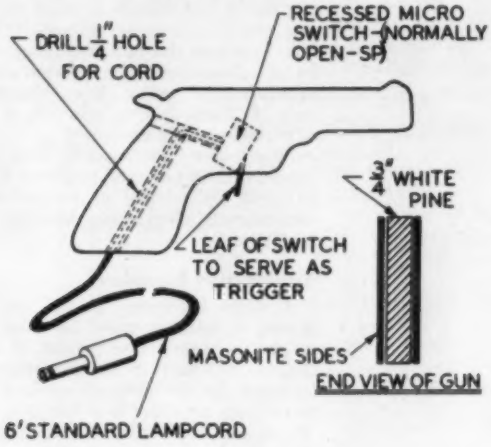
Starting or Runner Buttons

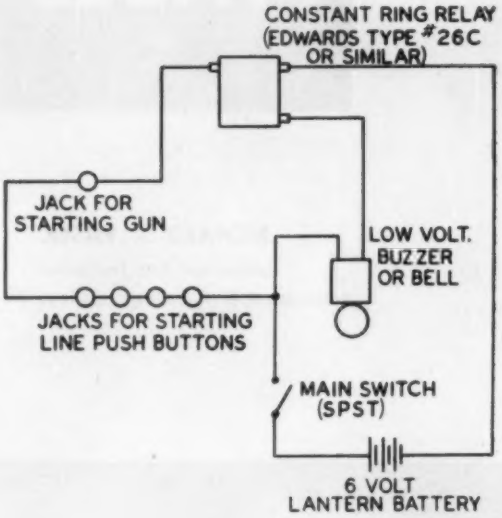
The bases for the starting buttons are made from soft white pine and are painted red. Any type of dorbell push button will serve as runner buttons. The cord should be 6 ft. in length to prevent its being run under the runners' feet and be made into a stumbling problem. The project needs at least two starter buttons for two "runners" but this version can accommodate four runners. If more buttons are desired for more track stars, wire more jacks in the control cabinet in the established series. Make as many buttons as necessary.

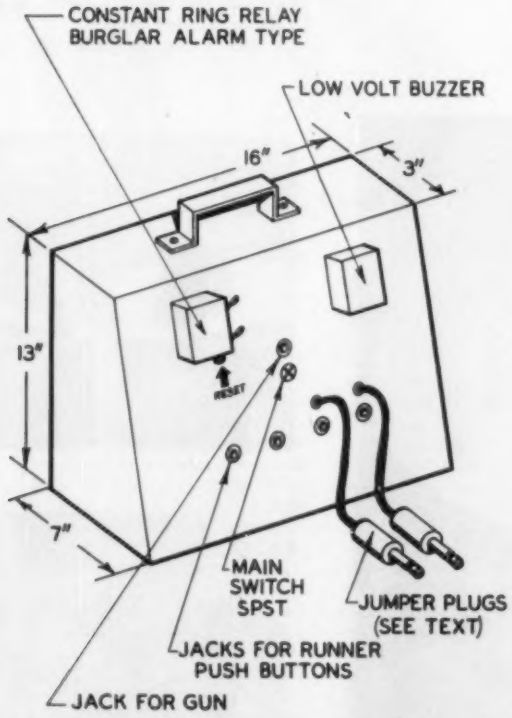
Maintenance

Since the cabinet is constructed ruggedly of wood and painted flat black, dirt and maintenance are no problem. The only requirement will be a yearly battery change.

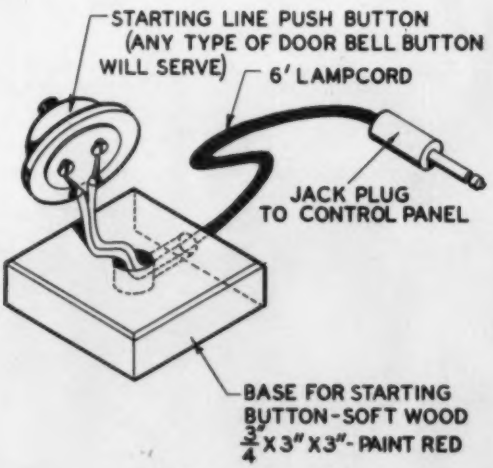
NOTE— GUN IS A SANDWICH. THE CORE IS SOLID WOOD AND THE SIDES ARE HARDBOARD. THIS WILL ENABLE THE CONSTRUCTOR TO CUT A RECESS FOR THE MICRO SWITCH. FINISH GUN WITH A DULL BLACK PAINT. ASSEMBLE GUN WITH WOOD SCREWS TO ENABLE LATER REPAIRS TO BE MADE IF NECESSARY.


DRILL 1/4" HOLE FOR CORD
RECESSED MICRO SWITCH-(NORMALLY OPEN-SP)
3/4" WHITE PINE
LEAF OF SWITCH TO SERVE AS TRIGGER
MASONITE SIDES
END VIEW OF GUN
6' STANDARD LAMPCORD


CONSTANT RING RELAY (EDWARDS TYPE #26C OR SIMILAR)
JACK FOR STARTING GUN
LOW VOLT. BUZZER OR BELL
JACKS FOR STARTING LINE PUSH BUTTONS
MAIN SWITCH (SPST)
6 VOLT LANTERN BATTERY



NOTE— CABINET IS MADE OF SOLID 3/4" WHITE PINE EXCEPT FRONT AND BACK PANEL AND THEY ARE MASONITE. PAINT FLAT BLACK.


STARTING LINE PUSH BUTTON (ANY TYPE OF DOOR BELL BUTTON WILL SERVE)
6' LAMPCORD
JACK PLUG TO CONTROL PANEL
BASE FOR STARTING BUTTON-SOFT WOOD 3/4" X 3" X 3"- PAINT RED

LAZY DINE TABLE

RICHARD J. VASEK
Industrial Arts Instructor
Arkansas A & M College, College Heights

Have you ever had the experience of being near the middle of a long table and had your food get cold while you helped serve those around you? Here is an idea picked up from an old table that had a movable center portion resting on top of a pipe and flange which came up from cross braces beneath a circular table.

This table will accommodate eight people for a full-course meal.

It can be used in a dining room for the family and visitors or made smaller and placed in a breakfast nook. Those who have seen this table were impressed by its uniqueness. Those who use it appreciate its utility. Even though it may be overloaded on one side, it will still rotate with ease.

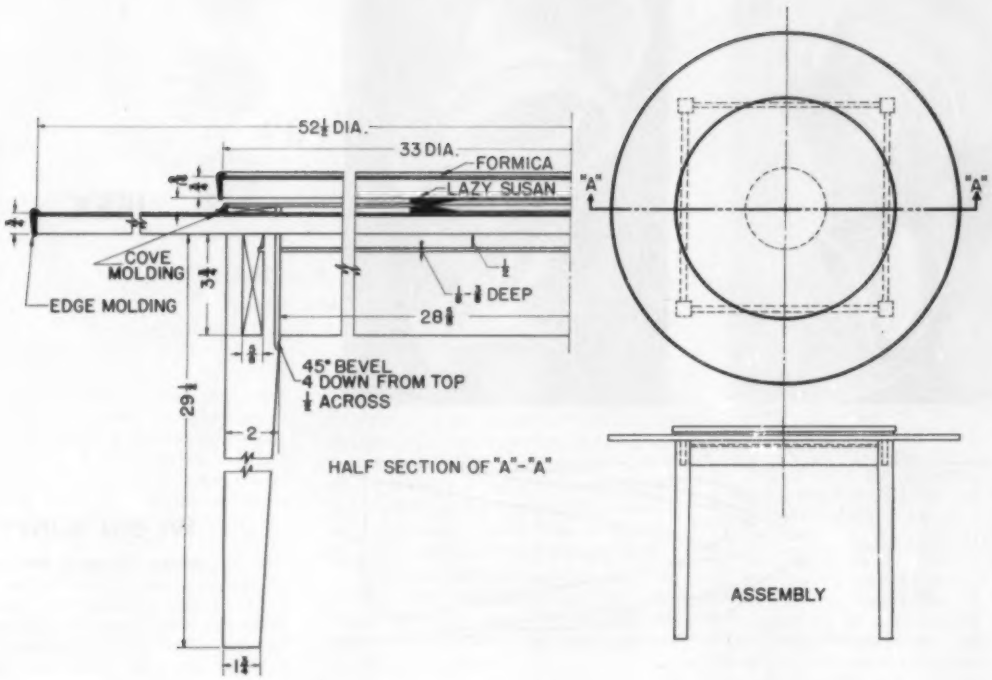
This project, which can be made with standard hand tools and machines found in most high school or college wood laboratories, offers many learning possibilities.

Construction Procedure

1. Glue laminated plastic to two pieces of ¾-in. plywood for table and to one piece for center portion. It is, of course, necessary to use two pieces of plywood for the table section since plywood does not come in widths over 4 ft. Hardwood could also be used but it probably is not as practical.

2. Joint, dowel, and glue the two pieces of plywood for the table top. (It is necessary to first adhere the laminated plastic to the plywood and then joint and glue the two pieces in order to obtain a good joint.)

3. Set up jig on band saw to cut



both circles. (CAUTION: pin on which to rotate the circle to be cut must be perpendicular to the cutting edge of the band-saw blade so rotating work will not bind.) In order to set up for this operation, simply fasten a temporary extension to the right of the band-saw table. Then drive a nail through the bottom of the auxiliary table perpendicular to the cutting edge of the band-saw blade. The distance between the blade and nail must be equal to the radius of the circles to be cut. Next, drill a hole centrally into the bottom of the plywood sections, fit the hole over the nail, and rotate the work into the band-saw blade.

4. Cut sectors out of ¼-in. plywood and fasten centrally on table top. This will serve as a stop for the cove molding which will prevent food and liquid from spilling under the revolving center.

5. Screw anodized aluminum molding to both circles and to the plywood sectors.

6. Attach Lazy Susan centrally to small circle with wood screws and to large circle with stove bolts. It may be necessary to place a piece of plywood between the Lazy Susan and table so the revolving center circle will clear the cove molding.

7. Make legs by gluing 3 strips of 1-in. hardwood together and tapering on a jointer. If preferred, turned legs would be appropriate to enhance the circular design.

8. Make apron and cut grooves with table saw along top edge and both ends of apron in order to attach it to the legs and the bottom of the table. This is accomplished with the aid of metal or wood corner braces in conjunction with hanger bolts and "S"-shaped table-top fasteners which are used to fasten the apron to the bottom of the table.

9. Sand and finish legs and apron with desirable finish. Seal bottom of table so it will not warp when exposed to moisture.

10. Attach legs to apron with hanger bolts and table-leg braces, and attach apron centrally to bottom of table with table-top fasteners.

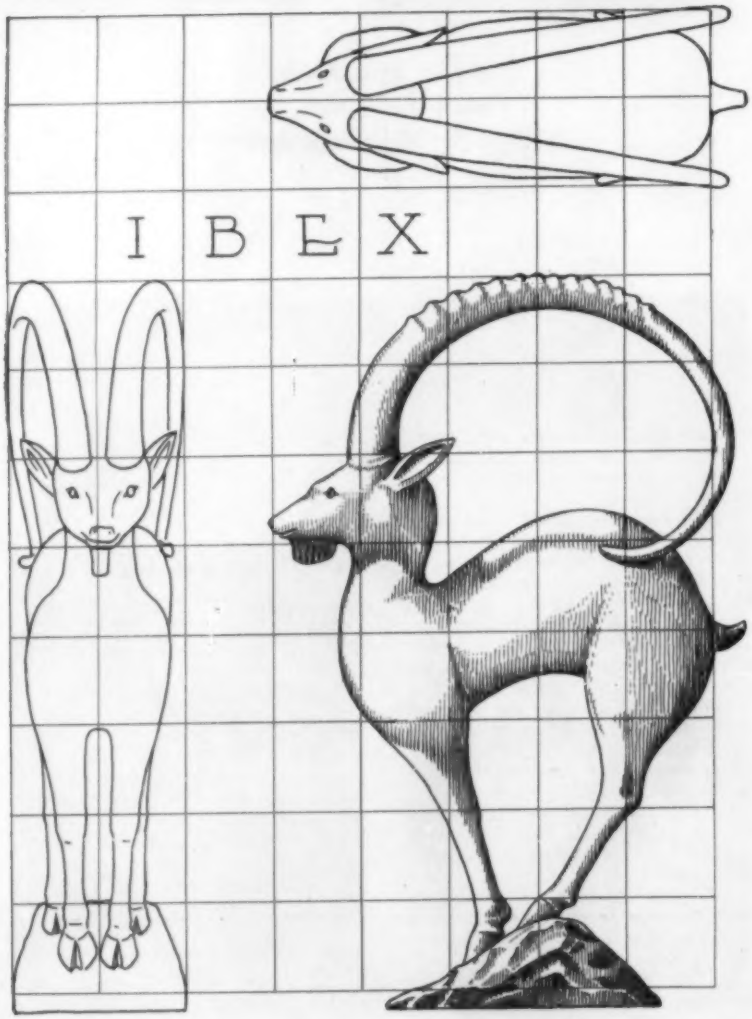
11. For further detail, refer to the drawing.

Bill of Materials

Quan.	*Material*
23 ft.	¾" anodized aluminum edge molding
9 ft.	7/16" anodized aluminum cove molding
1	1½' x 4' Formica
1	3' x 7½' Formica
1	¾" x 4' x 7½' plywood
1	¾" x 8" x 5' hardwood (apron)
1	¾" x 7" x 10' hardwood (legs)
4	4" table-leg braces and hanger bolts
1	12" Lazy Susan
12	"S"-shaped table-top fasteners

IBEX

W. BEN HUNT
Hales Corners, Wis.



We'll just have to call this one an "exaggerated" ibex. It was whittled out of sugar pine but I wish now I had used basswood or mahogany. The horns are just a bit too delicate for pine. In fact I had to glue up twice when too much pressure was applied in whittling. The grain runs up and down which puts a lot of cross grain in the horns. It was a question of cross grain in the horns or in the legs and since there are only two horns, against four legs, I chose the easiest way out.

You'll have to use a power jig saw with a 2-in. cut to saw out the inner sections.

The only tricky part of whittling is the horns. Lay them out carefully in pencil. With a hand coping saw, carefully saw out between the horns as shown in the photograph. The rest of the horns is easy with a little patience and a razor-sharp knife. The serations, or whatever they are called, on the upper part of the horns are best done with a ¼-in. rattail file. Since this figure was given a smooth finish, the whittling had to be quite smooth also.

The ibex may be left natural or it may be given a couple or three bomb spray coats of plastic or lacquer to prevent soiling from handling. You may wish to varnish it. But regardless of the way you finish it, it will still be a striking piece. (But I would set it on a high shelf, just to play safe.)

how to ease the burden of — PRODUCTION PRINTING

CHARLES E. DAVIS
Printing Instructor
Garfield High School, Los Angeles, Calif.

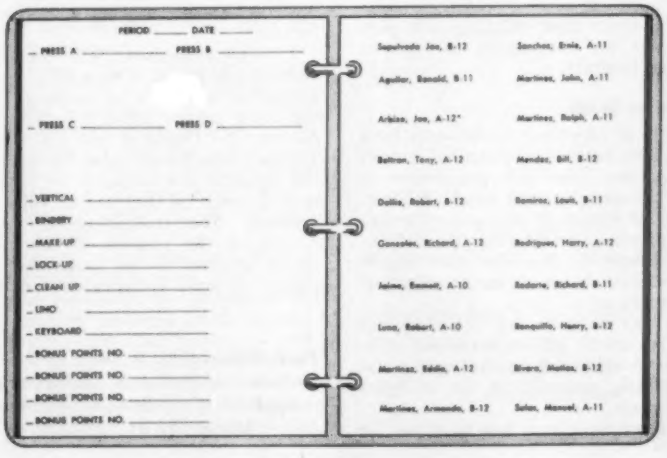
Production is both a pain and a joy to the printing teacher. The pressure to produce printing in a limited time often interferes with the instructor's well-laid plans for instruction. Yet, production, if properly used, can be the teacher's best means for providing meaningful experiences for the student. This article will not attempt to investigate the validity of production as a means of instruction but rather to suggest ways in which the printing teacher can more easily handle the production load placed upon him and at the same time increase its learning values to his students.

Production loads should be limited by the equipment available. No amount of manpower can overcome the lack of adequate production equipment. Automatic presses and line-casting machines help in easing pressures. However, one must guard against the possibility that these more complicated machines may merely shift work from the students to the instructor. Printing teachers should be employed to teach printing and not be expected to do production printing before and after school.

Given adequate equipment, the most important single factor in handling production printing is proper planning and organization. Three instruments aid in this planning: a job-ticket envelope, a job register, and a combination planning and assignment book. The proper use of these will enable the printing teacher to maintain adequate control over all work in the shop and assist materially in the planning of the learning experiences of the students as they perform production work.

The Job Ticket

The job-ticket envelope is universally accepted by industry. It provides a place to write down all necessary information concerning the job. The instructor may be spared many interruptions throughout the day as work progresses and questions arise if care is taken with this necessary task. By printing the job ticket on an envelope it may also be used to store copy, dummies, proofs, and a completed copy of the job.



The Job Register

The job register is a serial listing of all jobs, giving a short description and the delivery date. Jobs are checked off as completed, thus it gives a complete picture of all work in the shop at any time.

The Planning and Assignment Book

The planning and assignment book gives the instructor his key to classroom management of production. This book is a ring binder containing one sheet per day for each class working on production. These sheets are preprinted forms arranged so that when the two facing pages are opened up, the form on the left lists the various work stations available in the shop and the right-hand page lists the names of the students in that particular class. The work stations would be such things as the different presses, hand composition, linotype, make-up, lock-up, bindery, clean-up, written assignments, etc. One should make certain that there are enough work stations to cover the maximum number of students per class. Your policy on personal projects will enter into the picture here.

Before class the instructor refers to the job register and the job tickets to see what operations on the jobs can be worked on at this time. He enters these operations on the planning side of the book under the proper work station. A brief description of the work necessary to be done should be given. This gives the instructor a picture of all work in the shop and the equipment available to produce it. The next step is to assign to each student one of the work stations listed on the left-hand page. This is done by writing the name of the work station under the printed name of the student.

The book is placed in a prominent position as the students enter the room. After referring to it many of them can go right to work and the instructor can spend his time with those who are doing a new job or are working on a difficult one.

Besides increasing the production efficiency of the shop this book also gives the instructor a place to do advance planning. At the first of each week the instructor can go through the pages for that week and make notations of irregular schedules and deadlines for particular jobs. He can also schedule instructional units, personal projects, etc. After the year is completed the instructor has a complete record of that school year which is valuable in scheduling production and clean-up at the close of the school year, etc.

A system of this type is not limited in its use to printing teachers, but could be used by any shop teachers faced with production work — such as teachers of advanced auto shop.

The printing teacher that does efficient planning in producing his production printing will have time to increase his instructional program and be able to broaden his total program.

industrial arts and special education

special report

Preparing I-A Teachers for Exceptional Children

GEORGE A. WILLOUGHBY

Acceptance of the principle of adjusting instruction to the abilities and needs of each individual student by the classroom teacher has led in recent years to the development of increasing numbers of special education programs in local school districts.

While today's programs vary greatly with the size and the character of the district — involving widely differing degrees of specialization in methods, curriculum, personnel, and facilities — most systems provide programs directed to at least three major divisions of exceptional students: the slow learner, the physically handicapped, and the fast learner.

An important area of special education serving these three needs should be industrial arts. This relationship is noted in the Office of Education's booklet "Teaching Rapid and Slow Learners in High Schools" when it states that "Knowledge of individual differences of pupils was an important factor leading to the introduction of industrial arts courses in American schools."

To help I-A departments contribute more substantially to this vital area, the following pages consider key aspects of the role of industrial arts in special education by highlighting current better practices. The special report consists of: (1) an article on one successful effort in preparing I-A teachers to serve this challenging and demanding field; (2) two discussions of what can be done for slow learners in the school shop; (3) an outline of how to program for the physically handicapped; and (4) two programs for the above average student.

The values of various industrial arts activities have been recognized for many years in planning, developing, and improving programs for exceptional students.

Some 30 years ago, the industrial education department of Eastern Michigan University (then Michigan State Normal) co-operated with the school's department of special education in establishing general industrial arts courses which provided opportunities for the development of teacher prospects who could adjust their thinking and plan programs for exceptional, as well as normal, students.

Bases for Study

Years of experience in this area have developed bases for planning courses for teachers who wish preparation in industrial arts for exceptional children. The most important points to remember when developing such programs include:

1. Prospective teachers must appreciate and be able to recognize individual differences of all types.
2. They must develop the ability to analyze various subject areas and techniques in industrial arts and craft areas as to their potentialities for all types of students.
3. They must learn how to adjust the content and method of these areas for all their students.
4. They must be provided as many general industrial arts experiences as possible.
5. They must have courses with objectives stated in terms of industrial growth.

Courses Offered

The industrial arts courses offered to prospective teachers of exceptional children at Eastern Michigan University include:

1. *General woodwork.* This course has considerable emphasis on hand processes applied to a variety of projects, ranging from simple carving to advanced construction. Selected and constructed for their educational value for students, the projects are analyzed for interest and challenge as they are actually constructed. The student-teacher places himself in the position of the exceptional student as he undertakes the project in order to appreciate problems

Prof. Willoughby is head of the Department of industrial education and applied arts, Eastern Michigan University at Ypsilanti.

"Industrial arts classes, in many cases, are more meaningful to the exceptional child than to the so-called normal child because the skills learned in the use of tools and machines will affect the lives of the handicapped more than the rest of us.

"The mentally handicapped child often depends upon the use of his hands to offset the lack of his academic ability. A general shop background, with understanding instructors, may mean the difference between a gainful, successful life or an existence of continual public support. It has been proven that the mentally handicapped can learn to do a good job with the use of various tools and machines if the instructors will detail the work slowly and clearly. Once this type of student understands the fundamental operations, he is very willing to go all out. . . .

"To the physically handicapped the industrial arts shop classes may have various meanings. Much of this will depend upon the individual and his disabilities. The method of instruction for a crippled child in a wheel chair will differ from that given to a blind child. The techniques would have to be brought down to the individual's level depending upon the physical handicap. Working with physically handicapped in a shop can be interesting and very rewarding. The final results can be tremendous."

—Lawrence E. Miller
Co-ordinator of the Mentally Handicapped, Fordson High School, Dearborn, Mich.

of the student; this analysis forms a basis for planning the presentation and application to the exceptional student.

2. *General metalwork.* Utilizing the same planning and analysis, this course develops projects providing for creative thinking, problem solving, hand processes of all types, and the uses of simpler machines. Instruction again emphasizes planning and evaluating of potential values and problems of projects for all types of students. The projects use sheet metal, band iron, and metals for casting.

3. *Art metal and plastics.* Planning and developing artistic projects in brass, copper, pewter, silver, and other nonferrous and precious metals, and projects in such plastics as styrofoam, plexiglas and lucite, and resins for internal carving and lamination, etc., form the basis for this course.

4. *General crafts.* Excellent opportunities for all types of students — from the handicapped to the exceptionally talented — are possible in this general shop or "art and craft" area. Projects in this course include leather work, weaving, ceramics, finer types of woodwork and metalcraft, glass etching, plaster casting, etc.

5. *Printing and graphic arts.* Here is another area with activity which offers many opportunities on various levels. From making linoleum block carvings to letterpress and offset printing to book repair: the projects can assist handicapped students in learning to spell or can assist gifted students in learning to appreciate complex types of printed material.

6. *General drawing and planning.* The purpose of this course is to provide instruction in the practical uses of drawing, ranging from the simplest plan to advanced types of design. The drawing is used as a basis for expressing ideas, as well as a stimulus for "reading" its application in newspapers, brochures, magazines, and in common uses in business and industry. Areas of work include: room or home plans, pictorial illustrations, geometrical shapes and figures, charts, patterns for sheet material projects, project drawings, graphic reproduction methods, etc.

Although drafting may be quite difficult for a mentally handicapped student, there are basic elements of drawing that he can do and, in some cases, simplified drawing may be the best method for him to present or develop his ideas. Drawing, as a universal language understood by those who can neither read nor write, has great potentialities in this area.

7. *Introduction to industrial arts.* In this course the potentialities of all areas of industrial arts and crafts are carefully studied and analyzed as to their values in the development of all students and as to their application in meeting the specific competencies desired or possible for the handicapped, the "normal," and the students with exceptional abilities. Studies are made of tools, material, and machines, as well as basic operations or processes involved in the simplest and most complicated areas of construction.

In this course varying abilities of students and basic factors entering into their success and happy living are studied extensively. This study bases the recognition of the personal characteristic of mentally handicapped and exceptionally "bright" students and how industrial arts instruction can serve their needs. Some handicapped people have characteristics, for instance, which developed might make them more valuable to society, than normal or even exceptionally fast students in academic areas.

At Eastern Michigan's Horace H. Rackham School of Special Education, industrial arts students, along with those from other areas, teach such courses as general crafts to exceptional children.

industrial arts and special education

The slow learner: how industrial arts can serve this group is discussed in (1) an article on principles and (2) a report on one specific program.

Teaching Industrial Arts to the Remedial Pupil

JAMES J. RUNNALLS

Placing remedial pupils in industrial arts is becoming increasingly common. While some teachers feel industrial arts is being used as a "dumping ground" for those who can't get along in the academic subjects, many others are proud of the service they are performing in the education and adjustment of young people who would otherwise be lost in fast-moving general education programs.

It might be interesting at this point to note what an office of education bulletin has to say about slow learners or remedial pupils:

> Knowledge of individual differences of pupils was an important factor leading to the introduction of industrial arts courses in American schools. In fact, some schools considered industrial arts as a "special subject" for pupils with manipulative rather than academic interests. Often pupils were encouraged to enroll in industrial arts courses because they had individual interests, aptitudes or talents which were different from those usually considered essential for success in traditional courses where a premium was placed on verbal and abstract reasoning abilities.[1]

[1]U. S. Office of Education, *Teaching Rapid and Slow Learners in High Schools* (Washington, D. C.: U. S. Gov't Print. Office, 1954), No. 5, p. 69.

Mr. Runnalls teaches woodwork at the Port Huron, Mich., High School.

Who are remedial pupils? Blair says this about remedial pupils:

> Pupils — who do not possess any particular defects or faults which need correction, but who urgently need assistance in developing increased competence in reading and the other fundamental processes.[2]

The methods of presentation of industrial-arts subject matter to remedial pupils is altogether different from those used on normal children or fast learners. The methods of presentation can be broken down as follows:

Shop Organization

Shop organization plays the most important role in teaching remedial pupils. The industrial-arts teacher, if he is to be successful, must make the pupils feel that they are wanted in his shop and are not there just because they failed to grasp the essentials in one of the academic subjects. The teacher should rapidly learn to recognize his pupils in the halls as well as in the classroom and be able to call them by name.

The pupils must be given immediate responsibility of some nature in the organization of the shop. Too often remedial pupils in the academic classroom are the last to receive some kind of responsibility. The teacher must be alert, on the other hand, to see that remedial pupils are not given more authority than they can handle, since there might be danger of alienating their friends and classmates in carrying out their duties. All boys desire to have a feeling of authority and the industrial arts shop easily affords them this opportunity.

[2]Glenn M. Blair, *Diagnostic and Remedial Teaching in Secondary Schools* (New York: The Macmillan Company, 1946), p. 15.

Subject Matter

In the academic classroom remedial pupils are presented with textbooks and told to get their lessons and materials from them. Because most remedial pupils fail to comprehend written lessons and assignments, the industrial-arts teacher can best present his material by means of short specific lectures and demonstrations.

Shop textbooks are usually well illustrated. The teacher can read over the lesson with the pupils and point out the illustrations to them and discuss various points as they go along. In this manner it is possible for remedial pupils to learn word association and perhaps eventually become proficient readers. As mentioned previously remedial pupils need added competence in reading and, if they possess a strong desire to learn in industrial arts, they will find it almost necessary to learn how to read.

Written assignments must be kept to a minimum. Any written work must be on a voluntary basis on such items as special reports on tool usage or material sources. Special credit in the form of grades or class recognition acts as an incentive for remedial pupils' initiative. The class as a whole may be led to elect to do sample research work from the shop library by careful planning on the teacher's part. Pupils' interests in industrial arts can do much in improving their English proficiency where the English teacher might find it difficult to offer effective motivation.

Shop mathematics should be carefully introduced. As soon as pupils realize that they must be able to read a rule to measure off stock, they will start asking for the teacher's assistance — at which instance the teacher can make it a point to stop the whole class and find out how many can read a rule. With the assistance of those who can read a calibrated rule the teacher can give a short lesson on reading a rule to be followed up a few days later with a spot check to see what learning has been retained.

Simple multiplication and addition can best be presented by teaching board-foot measurement and project costs. Since most industrial-arts pupils are interested in knowing why their projects cost a certain amount, they will readily learn the simplest of multiplication and addition in order to account for their finances.

Shop Safety

The methods of determining remedial pupils' knowledge of shop-safety rules will be a most difficult unit for the teacher to test. In normal classes, tests can be required before use of power equipment is permitted. Remedial pupils are taking shop classes primarily to learn to use power equipment. To keep their interest high, pupils must be permitted to use power equipment, if their age and physical size permit.

Shop safety can best be taught by careful oral presentation of shop-safety rules followed by demonstrations in the proper application of these safety rules. Pupils must be carefully checked out on each piece of power equipment that is used. In no instance must the teacher ever assume that pupils will be proficient in the use of power equipment after the first individual demonstration but they must be carefully watched until the teacher is certain that they have developed the attitude and skill to use the equipment safely.

Demonstrations

Demonstrations will prove to be the most effective teaching aid of the teacher of remedial pupils:

> Most industrial arts teachers use the "show how" method of demonstrating processes and operations students use constructing projects. This method of teaching slow learners is used with almost the same emphasis by industrial arts teachers in all types of secondary schools.
>
> The need for reliance upon teacher demonstrations is apparent because the second- and third-rating for slow learners place emphasis upon the development of simple handtool-using skills and the provision of opportunities for intensive repetitive tool-using exercises.[3]

One of the main reasons for the remedial pupils' being slow learners is their brief interest span. The industrial-arts teacher must be careful not to give a demonstration that is so lengthy that the pupils lose their interest before the key points of the demonstration can be brought out. The teacher must be alert and watch for wavering of the class attention in cases where he is not well enough acquainted with the pupils to know how much they will be able to digest at once. Once bored with a demonstration, pupils often lose their interests in any future demonstrations in that class.

Now that greater emphasis is being placed on the "solids," industrial-arts teachers must develop and maintain programs for those pupils not qualifying for high academic standing. The industrial-arts teachers are particularly challenged by their opportunity to aid these remedial pupils in becoming positive additions to society.

[3]U. S. Office of Education, *op. cit.*, p. 73.

An Industrial Arts Program for the Slow Learner

MRS. PALMER REPPE and CHARLES F. WROBEL

The techniques, projects, and equipment of industrial arts contribute substantially to a positive, dynamic program for slow learning children in the Menomonie, Wis., schools. More than a chance to get slow learners out of the way of "real education," the program enables the youngsters to become self-sufficient citizens.

This program developed, as have many similar ventures, from an acute need to provide something educationally constructive for such children where nothing had existed previously. The instructor organized the program with the help of the present superintendent, William Terrill, to provide specialized facilities and instructional techniques for the children. She tailored English, arithmetic, spelling, reading, etc., to meet the individual requirements of each child.

Mrs. Reppe is a teacher of the exceptional in the Menomonie, Wis., schools and Mr. Wrobel is a student of industrial education at Stout State College in Menomonie.

Mr. Wrobel working with a group of slow learners on a bookbinding project.

Mrs. Reppe using posters and display boards as aids to illustrate stenciling tool safety.

A Need for Industrial Arts

In developing this program, the need was seen for an arts and crafts program in which the exceptional children could put to work their hands and minds in order to express themselves to their capacity.

Fortunately, at that time, the possibility of sending college students from neighboring Stout's educational psychology class to observe and help in this relatively new program was approved. With the help of one of these students, an industrial education major, appropriate projects in industrial arts were organized and planned.

The first consideration in broadening the typical classroom instruction of exceptional children by addition of an appropriate program of arts and crafts was to determine which industrial arts projects, in terms of safety and somewhat limited space and cost, would be best suited to such children. Results of a program of careful, co-operative experimentation, consisted of the following craft areas:

Leathercraft, being rather inexpensive to set up from the standpoint of tools, materials, and work area, was introduced first. Leather craft kits containing comparatively easy projects are purchased from manufacturers. In fact, some of the more able pupils develop their own patterns and projects. Embossing tools are purposely without sharp edges because of the safety factor involved. Creation of belts, small handbags, wallets, and key cases provides interest-holding, successful projects which offer to even children of limited ability valuable manipulative experiences in embossing, stamping, tooling, and dyeing.

Marbling is proving to be an easy, beneficial project for all members of the class. Through the use of varied inks and different types of papers, the children produce interesting patterns and designs in a wide spectrum of colors. Necessary equipment is printer's ink, obtained at any printer's supply house, non-toxic paint thinner, any type of paper, and a wash pan or tub for the water and ink. The fact that no tools are necessary makes marbling an especially safe project.

Wood burning, in kit form, requires little work space and has stimulated much enthusiasm. However, only one child at a time is allowed to use the electrically-heated engraving tools — and only under close supervision. During the Christmas season, each child made an engraved wall plaque for his or her parents.

Stick printing is an aid in the teaching of color, harmony, rhythm of design, and expression. Although paper of any size can be used, larger sheets are more desirable for creation of over-all patterns. Printer's ink, the same as that used for marbling, and a soft artgum eraser are the only essential equipment. Under close supervision, pupils first carve figures of birds, animals, stars, trees, cars, houses, etc., into one end of the eraser. Ink is then spread onto a flat surface with an ink brayer or small squeegee and the eraser is dabbed into the ink for hand stamping on paper. Several erasers and colors can be used at one time if the various inks are restricted to specific areas of the inking surface. The students have turned out some very interesting designs which have proved excellent as end sheets in bookbinding.

Bookbinding was an activity seriously-questioned at first because of its complexity. However, after careful experiments, saddle stitching of light magazines was decided upon and has proved to be a very interesting, appropriate project. These exceptional children are instructed how to saddle stitch the soft-covered magazines and periodicals and to make memo pads, scratch pads, scrapbooks, and photo albums. Removing of old stitching or staples and punching of new holes are done by the teacher. Sewing, trimming, gluing, selecting colors of stock, and making end sheets are responsibilities of students.

Necessary bookbinding equipment includes a tinner's awl for punching thread holes, a harness needle, heavy thread, wheat paste, cover material, a V-shaped trough, scissors, and a table-size paper cutter. Because of the initial investment required for this activity area, it should perhaps be introduced last. The teacher must be aware, too, that close supervision is essential at all times.

Basket weaving, also purchased in kit form, is a popular activity in which the whole class participates at one time. The same pan which was used for marbling is now used to soak the basket materials. Tools are not necessary, virtually eliminating the possibility of injury. The teacher sits at the head of the table and slowly weaves a basket while the class follows easy directions and duplicates the teacher's actions.

Weaving, also purchased in kit form, has been attempted on a rather limited basis. With a class of 80 per cent boys, engendering enthusiasm or motivation for this activity has been rather difficult. However, the girls have created interesting designs, as well as very useful and practical place mats, doilies, and hot pads.

Graphic arts is employed very effectively in pastels, crayons, oils, water colors, and charcoal. Class interest is high in this area and children are encouraged to create freely.

Plaster of paris is a craft area which rates high with the exceptional class, although the activity itself is a bit messy. Students make their own molds, form fill them with the plaster of paris, then paint the figures and glaze them. Use of this material requires a good deal of preparation, work area, and time.

Clay modeling is especially popular with the class, and some very interesting creations have resulted. This particular area has worked quite well for the children who are deeply disturbed because here they are allowed to "work out" any latent hostilities.

Soap carving deserves mention because it has proved successful as an emergency project for the slightly more able students who finish other projects in advance. Regular table knives, with the blades cut off about ¾ in. from the handle and ground into different shapes, are used for carving. Inasmuch as soap doesn't require a sharp cutting edge on a knife, a well-rounded tip is satisfactory.

Audio-visual aids have proved very effective for teaching these exceptional youngsters. Through the school library, lending agencies and private sources, appropriate films on arts and crafts, world travel, and industrial arts are readily available. And whenever the written or spoken word does not communicate to the slow learner, audio-visual aids are an absolute necessity. Thus, instruction in proper handling of tools and materials has been greatly facilitated through films, displays, posters, blackboards, bulletin boards, and flannel display boards. In fact, the students are now being taught how to make their own uncomplicated audio-visual aids and to use them.

industrial arts and special education

The physically handicapped: a discussion of the objectives of industrial arts for this group on grade and junior and senior high school levels.

Industrial Arts for the Physically Handicapped

R. V. ECHELBARGER

The physically handicapped person can contribute effectively to society if given the chance. Just as normal healthy children have to discover what they can do best to compete in society, so do handicapped children. The main purpose of special education is to bring out all the potentials a person has — whether he is crippled by a birth defect, is incapacitated by an accident, or stricken with disease. An important purpose of our educational institutions is to help children discover their potentialities and develop them. This is accomplished through the curriculum, which can be generally defined as a summation of all the experiences in which students are engaged under the direction of the school.

At The Crippled Children's School the following things have to be considered when setting up an industrial arts curriculum:

1. All students attending this school must have mental ability within the normal range.
2. Students participating in the program will range from fourth grade through senior high school.
3. The students are physically handicapped and attend class in wheel chairs and on crutches.
4. Students with severe handicaps are to be evaluated as to the extent of their physical abilities.
5. A number of students will be going to college, therefore skills that will benefit them in college should be developed.
6. Some students will go on to jobs after high school, therefore the program should be pre-vocational for these students.
7. Some students, due to severe physical involvements, will never be able to compete in society, therefore a program to benefit these students must be available.
8. Students with superior mental ability need the individual accelerated program.
9. A number of students who border on the average intelligence are also in need of a specialized program.
10. Students in this school are so physically handicapped that they cannot attend public school.

Objectives of the Program

In grades four, five, and six there are severely handicapped as well as mildly involved students. The program at this level is introductory in that they are encouraged to touch, feel, and work with various materials. Simple lectures are given concerning the kind of material,

Mr. Echelbarger is a member of the industrial arts department of The Crippled Children's School in Jamestown, North Dakota.

Below: an overall view of the shop, illustrating the portable tool panel and various machines with their special equipment. Right: A fourth-grade student operates a drill press safely.

what can be done with it, where it comes from, and how it is manufactured. An example of the level of learning can be illustrated by the following experience in photography:

The school's Rollicord camera was set up and each student took the photograph of another. The film was developed, the contact prints made, and finally 5 by 7 in. enlargements were made. Each step was carefully and simply explained to each student. He heard the process described and actually saw the prints made. Then the students were asked to write a story about the experience. From these stories the teacher is able to evaluate the effectiveness of the learning experience.

The students at this level are encouraged to be inquisitive. In ceramics the children are encouraged to make different objects, to feel the clay, to transform this pliable material into an attractive looking candy dish or ash tray. One of the greatest rewards of working with handicapped students comes in the form of a look of pride on a child's face when he takes his project home. These students who have to have help so often need the opportunity to create and do something themselves.

For Junior High Schools

In junior high the objectives of the industrial arts program are followed as closely as possible. Emphasis is placed on knowledge, understanding, and appreciation. The program at this level is designed to provide information regarding industry and workers, to develop hobby interests, to afford practices in safe handling of tools and equipment, to give opportunity for co-operative effort in groups, to illustrate and vitalize academic subjects, and to allow students to become familiar with the tools and machines of the department. Again severely involved students attend class with those who have capable hands.

The curriculum at this level is divided into two programs. Each student is interviewed prior to the beginning of the school year to determine his physical handicap. Students with hands that are steady follow the standard industrial arts curriculum and can earn industrial arts credit. Those students who have unsteady hands or retain limited motion due to the effects of cerebral palsy or diseases such as polio follow a program of complete evaluation to determine just what their physical possibilities are. These students rotate through the various areas. Comments that may appear on their progress reports may state: John can drive a nail with a hammer; John can plug a cord into an overhead hanging drop cord, but uses his neck and chin to hold one cord; John has difficulty operating the portable belt sander due to the trigger type switch.

Once the student is evaluated, he is encouraged to do most of his work in those areas where his interest is ideally high and he can operate the tools.

On the High School Level

By the time the individual student reaches high school, a fairly complete picture is formed of his physical abilities, his mental abilities, and his interests. In high school, the curriculum should provide experiences that will be valuable to the student after he is graduated, whether he goes on to college, gets a job, or returns to his home and the care of his parents. Most of the objectives of the industrial arts program can be realized by all students regardless of their handicap.

A student who may be in a wheel chair or on crutches can compete with normal students in all areas of the industrial arts program. If the operation requires one to stand to operate the machine, to bend to pick an object off the floor, or to reach over a bench for a tool — and the student's handicap does not permit this movement — he designs equipment to help him. Examples of such devices are: stand-up tables or adjustable platforms or lowered benches and portable tool panels.

Whenever possible machinery is lowered to facilitate working from a chair. The scroll saw in the industrial arts department has been lowered so a student can operate it from the sitting position. The theory behind this alteration is that a person who can stand can also sit, but a high machine can be operated only by a student who can stand.

The Differences

The most significant difference a teacher would notice between teaching physically handicapped students and physically normal students is the classroom discipline. Physically handicapped students generally appear to have more initiative and interest in taking advantage of the education they are offered. This may be due in part to the individual attention given to each student or to the fact that most handicapped students recognize their disabilities and strive to overcome them if possible, or at least to live with them. Class size is necessarily kept small so that this individual help can be given to each student.

An example of the initiative and drive exhibited by handicapped students was demonstrated by a student we'll call Jim. Jim's physical disability resulted from an automobile accident which severed vital nerve fibers in his spinal cord. He is paralyzed from the waist down and entered school after a period of convalescence. Part of his school day is spent on a device known as a Stryker frame, which enables him to lie on his stomach. Sometimes he can come to class in a wheel chair, but other times it is necessary to lie on his stomach for long periods of time, due to pressure sores. A small pair of crutches is used to propel the Stryker frame. In class he uses drawing equipment while in his Stryker frame and produces superior drawings.

During the school year, he was fitted with leg braces which came up to his waist. On the first day he wore them, he put them on by himself, walked a short distance, and took them off. It took him about 20 minutes to put them on and the same amount of time to remove them. He refused help from the physical therapist, stating that he should learn to do it by himself. The effort to place limp legs into complicated braces cost him a lot of sweat, pain, and energy. This operation caused Jim to be 30 minutes late to industrial arts class, which was clearly justified. When class was over, Jim made up the 30 minutes, without being asked, and stayed another 20 minutes to be sure he did his class work for the day. Initiative is helping to offset a handicap.

In Summary

An adequate curriculum for an industrial arts department must provide for the needs of the students that participate whether they are physically sound or physically handicapped. A curriculum must vary from school to school as the needs of the individual students vary.

As the society in which man lives is constantly changing and becomes increasingly complex, a curriculum must be flexible enough to keep pace. If this does not happen, our educational institutions are not fulfilling their obligations to society.

Society must provide education for all students who can benefit whether they are physically handicapped or mentally retarded. How well they are educated is the responsibility of our schools. Every school should provide special education.

This student propels a Stryker frame with small crutches and draws in the position shown.

industrial arts and special education

the fast learner: two approaches (enrichment and segregation) toward upgrading industrial arts to serve the needs of this very challenging group.

An Industrial Arts Program for the Gifted

CARL J. KNOLL

How can you alter an industrial arts program to fit the widely varying intellectual capacities and interests of the classes entering your laboratory? This ability spread can best be illustrated by pointing out that one group has an average mental age of seven point eight, while another is so intellectually superior that the class dolt boasts a 120 I.Q. The intent here is to offer one program for general metalworking that will appeal to and motivate the gifted ninth-grade student.

Approaches to the Problem

When the author decided that his basic program was not specifically suited to these children, he sought advice from other experienced teachers of industrial arts and discovered that they attempted, for the most part, to handle the problem in one or more of the following ways.

Some felt that the basic program offered was satisfactory for youngsters of every conceivable degree of intellect and ability, thus making necessary no change other than one of quality. They expected that projects would be better and more intricately constructed, that quality would be improved by greater student participation in project design and planning, and that homework and other outside preparation would also reflect greater merit.

Others considered that children of superior intelligence do not necessarily evince great digital and manual dexterity and that they should not, therefore, be expected to produce projects of greater value than those constructed by boys of lesser intelligence. These instructors attempted to enrich their programs quantitatively by introducing more related information, by giving more frequent homework assignments, and by requiring research papers, many of which were directly copied from the encyclopedia, a procedure of doubtful learning value.

Still others offered these gifted children a combination of both quantitative and qualitative enrichment of the industrial arts program.

While this is generally accepted practice, it was felt that simply altering the existing course of study would not satisfactorily meet the needs and wants of gifted children. In each case, the changed program was based upon what the teacher assumed was good for the students and not upon what he definitely had established as student interests and preferences. Thus, a study, albeit an informal one, of student interests was indicated.

Mr. Knoll is an instructor of woodworking at the Catonsville, Md., High School.

Course Content

This was achieved by meetings with classroom teachers to determine student aptitudes and interest, with school librarians to discover what particular category of reading most appealed to the boys, and with the youngsters themselves. Students were not told why they were being interviewed, but were questioned casually as the author "chanced" to meet them in the cafeteria, in the library, and in the hallways. This is done because an honest reaction was desired, not one the students felt was expected of them.

The results of these interviews were consistent. Although these boys were characterized by a wide range of interests, they all were interested in science. Most of them talked science, played science, and read science. Doubtless, they also dreamed science. They also had a strong predilection for personal investigation of any subject of deep interest to them and thoroughly enjoyed working in co-operative groups. Thus, a program was decided upon that would offer an opportunity for research into the several fields of physical science, personal research, and group effort.

The first such course of study utilized, "A Unit of Study into the History of Power," required that the class compile a history of power, with operating models, tracing the subject from the inclined plane and pulley to the solar oven and the ram jet engine. Of course, one group of students cannot be expected to cover this field comprehensively in 39 class periods, nor is any one student asked to survey any major area without help. The class was divided into committees, each of which is responsible for one phase of the study. Those phases of the subject not covered by students were taught by the instructor. Each committee was under the direction of a chairman, who was responsible for the direction of his group's work.

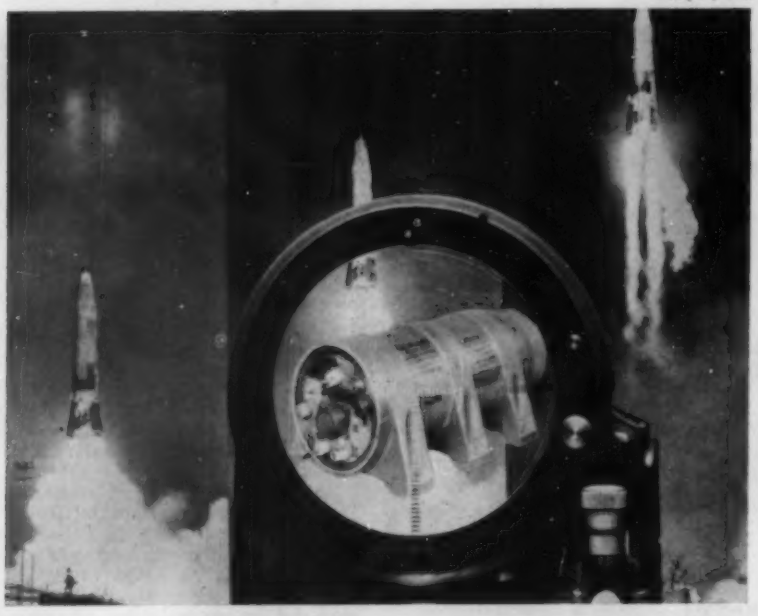
Basic Requirements

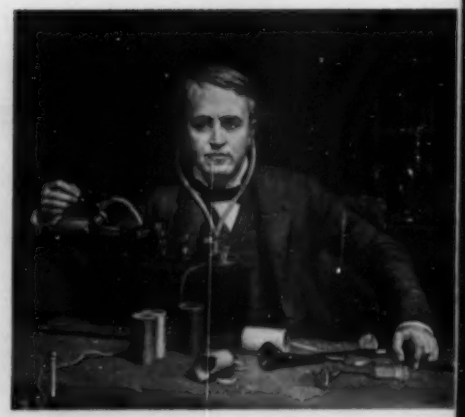
The basic requirements of the course were few, but equally important and interrelated. Each student was expected to read as widely as possible in his selected area of research, for which he was given library time. He also had to write a report of his subject, complete in every respect, including a drawing done on graph paper. It can be expected that this report would consist of (1) the time and place of discovery of his particular invention; (2) a discussion of the scientific principle or principles involved; (3) an explanation of how the project was built and of how it works; (4) a description of what changes it has wrought in the world and how it has served society; (5) a brief biography of the inventor, or of one who has done important research in the field; (6) a list of present and future applications; (7) and a bibliography.

The project itself should be an actual working model, such as a solar furnace that actually cooks or a ram-jet engine capable of exerting a definite, measurable force. This project must, of course, be scientifically accurate and built in conformity with established sci-

(Concluded on page 85)

— Melpar, Inc.





Facets of the exciting, challenging, explosively expanding world of electronics: (above) Melpar's telemetry beacon superimposed on a precision checking instrument, one phase of the new needs for space-age electronics; (below) the wondrous Univac 1105. At the right are historical sidelights of electricity and electronics: (top) Benjamin Franklin's famous experiment with the kite; (middle) Thomas A. Edison listening to his phonograph; (bottom) the first dramatic presentation by television in 1928 in Schenectady's General Electric plant.

— Armour Research Foundation

profiles in industry

▶ The first of a series of surveys of industries basic to vital phases of industrial education, here is a report on electronics — its history and present status with a capsule outline of skills involved in a single, large-scale project — to provide new insights for vitalizing teaching approaches

Electronics

R. A. MATTHEWS and R. J. WINTER
Technical Publications Staff
Melpar, Inc., Falls Church, Va.

"Go to the ant . . . and consider how to work" — thus the philosopher commended one of the world's smallest creatures as a model of diligence. But smaller even than the ant, the tiny electron labors mightily to sustain what has become a basic industry rated fifth in line with steel, automobiles, aircraft, and chemicals. Stimulated by two world wars, our nation's growing electronics industry has gained recognition through outstanding achievement and phenomenal expansion. Political tension — the present "cold war" — justifies indications of even greater expansion, for our national security depends upon electronics as an integral part of modern weapons and defense systems.

Few companies' products and experience reflect every plane and angle of the electronics industry profile. And in this delineation Melpar, Incorporated — a subsidiary of Westinghouse Air Brake Company — will concentrate mainly on its own specialty, military electronics. Even when so restricted, the outline will necessarily touch other aspects of a business that affects the lives of individuals and the course of nations. Within its chosen field, however, Melpar's capabilities encompass almost the entire range of modern technology. Of course some of Melpar's electronic products and techniques have non-military applications; and many of our nation's commercial and industrial products today are the direct result of original work in the military field.

HISTORY OF ELECTRONICS

The first half of the twentieth-century witnessed the growing to maturity of a new industry. Electronics originally meant only radio communication; today its scope embraces numerous functions. By definition, electronics is that branch of physics which deals with the emission, behavior, and effects of electrons. In the broadest connotation it covers practically all of electrical technology from operation of the simplest crystal receiver to automated machinery and the guidance of missiles. Electronic accomplishments, to name a few, have aided the building of a better world by enabling the performance of such functions as examining the germ structure of bacteria, seeing through fog and darkness, increasing business accounting efficiency, and communicating between any two points on earth.

Early Discoveries

The development of radio communication is the result of contributions by many scientists through diligent research and experimentation. Many of these discoveries occurred in the latter part of the nineteenth-century. James Clerk Maxwell, a Scottish physicist, proposed the following basic theories in 1865: (1) light waves are electromagnetic in character; (2) a charge of electricity moving through space constitutes an electric current as well as does a charge moving in the wires of an electric circuit; and (3) a magnet moving in space generates an electromotive force in the space around it. Heinrich Hertz, a German physicist, proved by experiments in 1888 that Maxwell's hypotheses were true. Hertz's studies revealed the behavior, wavelengths, and character of electric waves.

Guglielmo Marconi, an Italian engineer, invented the aerial (now referred to as "antenna") in 1895 and accomplished his first successful transmission in the following year, thus introducing wireless telegraphy. The earliest transmitters employed a spark-gap to create the radio frequency energy inductively coupled to the tuned antenna. These principles were discovered by Sir Oliver Lodge, an English physicist. In a later system of transmission, electric arcs or alternators generated "continuous" rather than damped waves. Receivers at that time used the coherer and the crystal detector.

The advent of radio was due largely to the introduction and development of the vacuum tube. The first vacuum tubes were used in transcontinental wired telephone systems in 1912. Improvements enabled the Bell System to transmit voice messages by wireless telephone from Washington to Paris and from Washington to Hawaii in 1915. Radio stations began experimental broadcasting before 1920, and in 1920 station KDKA of Pittsburgh was the first to begin regularly scheduled programs.

The Vacuum Tube

An interesting story in itself, development of the vacuum tube resulted from a series of overlapping events: Thomas Edison produced a working incandescent lamp. Sir J. J. Thomson, English physicist, discovered the electron. Sir J. A. Fleming, an English electrical engineer, invented a two-element vacuum tube

rectifier or detector for converting alternating current to direct current, a highly important achievement. The two-element detector became a voltage amplifier when Dr. Lee DeForest incorporated a third electrode called a "grid." Further study and experimentation by numerous scientists provided additional improvements leading to the modern vacuum tube.

Circuits

During the years advances were being made in the development of the vacuum tube, improvements were also being made in circuits of receivers and transmitters. A regenerative or "self-heterodyning" circuit was patented in 1914 by Major E. H. Armstrong, followed by his invention of the superheterodyne receiver in 1917. A "neutralized," tuned radio-frequency amplifier was developed in 1924 by L. A. Hazeltine. Far in advance of his time, Major Armstrong also invented a process or technique known as "frequency modulation" which greatly reduced the annoyance of static. Other circuit innovations or improvements were made by Hartley, Colpitts, Meissner, and Heising.

Military Accomplishments

The military services have always been in the forefront of new developments in electronics. The U. S. Army Signal Corps, for example, pioneered in spark-gap transmission; and in 1899 radioed experimentally across New York harbor. By 1908 the Signal Corps had 23 stations in the U. S. and various parts of the world. Their spark-gap sets ranged in power from 750 watts to 10 kilowatts! Military communication was taking on its 20-century characteristics.

Army acceptance of their first aircraft in 1908 helped set the stage for air-to-ground communication. Airborne transmitting was first accomplished by the Signal Corps in 1912 at Fort Riley, Kansas, and airborne receiving over Corregidor in 1914. Participation of the United States in World War I was not of sufficient duration to develop combat communications comparable to those of France or Great Britain. From our nation's research many types of ground and airborne radio equipment emerged, but too late to be used in the war. Our aviators flew French planes; their radio apparatus was supplied by the French. American spark-type radio sets were used to some extent, however, for fixed and mobile intelligence work. Perhaps the most important aspect of this period was the consolidation of scientific research efforts.

Following the Armistice, drastically reduced military budgets brought many laboratory projects to a halt. A few research projects continued at the Signal Corps Radio Laboratories at Camp Alfred Vail, Little Silver, N. J. (now known as Fort Monmouth); at the Bureau of Standards in Washington and at Navy research facilities. Around the year 1922 airborne radio began to achieve real importance as a distinct branch of electronics. Airborne equipment was being developed for communications, navigation and meteorology.

Unfortunately, patent difficulties plagued commercial use of Major Armstrong's superheterodyne circuit during the 1920's. In 1931, however, some of the disputed patents expired; and commercial companies competed to produce the new superheterodyne sets. In 1933 the Signal Corps Radio Laboratories released the design of a superheterodyne receiver, called the BC-189, which was the first of its kind especially designed to meet military objectives.

During the early 1930's, significant progress was also being made in air navigation equipment: the radio range receiver, radio compass, and an instrument-landing system which was later supplemented by Ground-Controlled Approach equipment. Another important development which followed in the late 1930's was a radio instrument for transmitting weather data from a balloon for meteorological research. Called a radiometeorograph then, it is now referred to as a radiosonde.

Detection and Ranging

Military requirements for detection devices led to many avenues of investigation; means were sought to detect approaching ships and aircraft. Many mediums were studied in the 1920's and '30's — sound, heat or infrared rays, ultraviolet rays, short wave, and microwave radio. Sound detection equipment was built for aircraft warning; and underwater sound detection (now called Sonar) was also achieved in the mid-thirties.

One interesting advance was a sort of "ear radar" used on the French liner "Normandie." Ultrahigh-frequency radio waves (15 centimeter) were transmitted in a 45 degree arc in front of the bow; waves reflected off an object a dozen miles away were picked up by a sensitive receiver and made audible.

In the early 1930's many governments sponsored concentrated efforts in the area of electronics then called "Radio Position Finding" but which later came to be known as "Radar," meaning *RA*dio *D*etection *A*nd *R*anging. The principle of pulse ranging was first employed in 1925 by Gregory Breit and Merle A. Tuve, of the Carnegie Institution in Washington, D. C., to measure the height of the ionosphere. The idea of using this technique for the detection of aircraft and ships was not novel. Various individuals undertook it independently and concurrently in America, England, France, and Germany about ten years after the original work of Breit and Tuve.

The research agencies of the U. S. Army and Navy had experimented for many years in this field. A few of the earliest successes are listed here as illustrations. Early in 1939, a radar set, identified as CXAM, was designed and built at the Naval Research Laboratory and thoroughly tested at sea on the "U. S. S. New York" during battle maneuvers. The success of these tests resulted in the award of the first contract for the commercial manufacture of radar equipment.

In November, 1938, radar position-finding equipment, the SCR-268, for the control of anti-aircraft guns and searchlights, was designed and built by the Signal Corps Laboratories of the Army and tested extensively by the Coast Artillery Board. And in November, 1939, an Army long-range aircraft detection set, the SCR-270, was demonstrated by the Signal Corps Laboratories and was subsequently produced in quantity for use by the Air Corps.

British radar was developed at about the same time but its application proceeded at a faster pace under the immediate threat to England. A plan for the detection of aircraft by the pulse method, worked out by Sir Robert Watson-Watt, a Scottish physicist, resulted in the first experimental system of this type being set up in the Spring of 1935. By 1939, a chain of radar stations had been established along the channel and the North Sea coasts. The British also concentrated on airborne radar, successfully demonstrating an experimental set for detecting surface vessels by patrol aircraft in September, 1938.

The British led in the effort to develop a microwave generator which could give pulse power adequate for radar use, allowing antennas to be made small enough to carry in an airplane. By early 1940, they developed a practical multicavity magnetron which produced about ten kilowatts of pulse power, and the history of modern radar had begun.

Meanwhile, radar developments in Germany had also been progressing rapidly. Germany had about 100 early-warning stations scanning the approaches to their defenses, and had a gun-laying radar — the Wuerzburg — ready to go into production.

The technical achievement represented by the wartime development of radar seems very nearly unparalleled. Radar in itself, however, was not the "be all and end all" of electronics; other developments of equal importance employed radar techniques only as tools — or not at all, as in communication.

Communications

During the years preceding the war, medium-frequency, high-power transmitters like the Army SCR-140 tended to replace the original long-wave sets, and in turn gave way to high-frequency, low-power equipment. This followed a trend established by the Navy and amateur radio operators. Often self-trained, the amateur operator cannot be ignored as a contributor to the advancement of radio. The nearly 200,000 licensed amateurs in this country represent the "staff" of a huge informal laboratory. Together with nonoperating electronics experimenters, their expenditures for equipment easily run into several million dollars per year. And these informal researchers quickly learned two advantages of using the higher frequencies: more distance with less power; and

reduced size of equipment. Both advantages were appreciated by the military in the second world war.

World War II Electronic Progress

World War II presents a confusing picture of intense effort channeled in a dozen directions — some of them crossing or paralleling. Factories produced fantastic quantities of war material without too much regard for cost. Of the electronic equipment manufactured, this much is known for certain:

1. Radar went to sea on ships of all sizes, flew in bomber and interceptor aircraft, or was moved from place to place on trucks.
2. Sonar, on surface craft, "looked" and listened for submarines — which also carried sonar gear.
3. Radio went everywhere, and in all sizes. The "walkie-talkie" hand-portable set captured the imagination . . . and improved the fighting ability of ground troops. Another less-publicized item was the IFF transponder, an automatic device in aircraft which identified an airplane as friend or foe to operators of search radar.
4. Signal analysis equipment accompanied land, sea, and air forces to scout the enemy's position and the nature of his electronic defenses. As a follow-up, electronic countermeasures helped reduce the effectiveness of the enemy's detection and communication devices.

A prime example of the wartime growth of the electronics industry is illustrated by the production of radar equipment. The expansion of radar production facilities which scarcely existed before 1940 is indicated by the fact that by the end of June, 1945, approximately $2,700,000,000 worth of radar equipment had been delivered to the Army and the Navy. At the end of the war, radar equipment was being produced at a rate of more than $100,000,000 worth per month.

So much equipment was produced that some still appears on the post-war market as surplus — equipment made obsolete by the almost constant advance of cold-war science.

Post-War Developments

With the close of World War II the burgeoning electronics industry turned a greater portion of its energies to commercial development and production. The uses of radar in a peaceful world were just beginning to be worked out in 1946. Frequency modulation or FM joined the advertiser's lexicon as a synonym for static-free, high-fidelity home radio reception. Shortly following, another lusty infant — television — began to clamor for adoption as everybody's child: initials, TV. Large-scale scheduled commercial "telecasts" beginning about 1946 signaled the introduction of television sets into American homes. But television was not new in the truest sense of the word. Standards adopted in 1937 still apply in 1960; and pre-war experimental transmissions had proved the feasibility of design. Why, then, did TV wait so long to appear on the market?

Melpar, Incorporated, As a Typical Electronics Plant

Carefully qualifying the word "typical," Melpar represents other government (military) electronics contractors by virtue of its diversified interests. Creative research and development accent the demonstrated ability of Melpar to design and produce electronic components, equipment, and systems. Extensive experience and technologies have accrued from exploration and application of the sciences associated with communication, reconnaissance, countermeasures, data processing, materials utilization, and training devices. Few electronic endeavors are completely foreign to this progressive firm.

A multi-plant subsidiary of Westinghouse Air Brake Company, Melpar covers nearly a million square feet of floor space in northern Virginia (Falls Church), Massachusetts (Watertown), and in Arizona (Tucson). Sound financial planning has characterized Melpar growth since establishment of the corporation in 1945. Headed by the executive management team, four operating divisions perform specialized corporate functions, supported by administrative and service departments. Executive offices occupy part of a modern plant in Fairfax County, Va., on the perimeter of Washington, D. C.

Recent figures put the employment level near 4800 — approximately the number of wage earners in a town of 12,000 population. Professional personnel include about 1100 engineers, physicists, chemists, aerodynamicists, and mathematicians. A separate incomplete listing illustrates the wide range of technical and nontechnical skills which support Melpar's activities.

Employees are urged to take advantage of a tuition reimbursement plan applicable to job-related education. Local universities and accredited schools offer night classes in technical and scientific subjects taught both on campus and in the Melpar plant. Employees taking approved correspondence courses may also qualify for tuition reimbursement.

Operating in co-ordinated programs, the four divisions produce a variety of end products and services: flight simulators, dynamic testers, reconnaissance and data handling systems, countermeasures and counter-countermeasures devices, etc. Elements for or related to missiles and space vehicles include antennas, fuses, radar beacons, communications, and navigation equipment. Melpar also supplies technical publications, and intangibles such as studies related to optimum equipment utilization, air navigation requirements, missile re-entry problems, and the human factors in a man-machine environment.

Melpar's basic research falls within the scope of the applied science division located in Watertown, Mass. Here advanced studies and experimentation evolve new system concepts, and project new applications of theory and technology. The engineering and production divisions constitute the largest industrial organization in the metropolitan Washington area. Within the engineering division model shops and laboratories, skilled technicians create prototype hardware and components. Manufacturing planners schedule quantity items through the facilities of the production division. At Tucson, Arizona, an extension of the engineering division provides Melpar support to military electronics activities in the Southwest.

Directed from the field service division headquarters in Virginia, field service engineers furnish world-wide installation, operating, and maintenance assistance to users of Melpar-built equipment. As a case in point, delivery of electronic flight simulators has been followed by field engineer-conducted formal training courses.

With our nation's resources pledged first to war preparedness, followed by all-out war production, military requirements severely taxed limited supplies of copper, steel, and tin. Those same military requirements, however, called forth Government-furnished capital necessary to develop and refine the mechanics of radar — technical details which borrowed much from television design. Thus military expenditures delayed, then accelerated, commercial television by establishing reliable sources of supply and securing the benefits obtainable from mass production.

Financed in part by Government money, electronics took on a new appearance during the war years. Microwave components began to resemble plumbing rather than conventional radio. Long-wire antennas gave way to vertical whips, dishpan-type reflectors, or contrivances resembling a fireman's pompier ladder. Perhaps most important to potential TV customers, the cathode-ray "picture tube" went up in size, down in cost.

By contrast with television, little public attention focused on the electron microscope in 1947 and 1948 even though its magnifying power had reached 300,000 diameters. The pipe-and-slippers newspaper reader more likely grunted his satisfaction that "someone was supplying airplanes" with better radio aids to navigation and air traffic control.

Those nameless "someones," however, were already casting the shadow of coming events. Consider these samplings from *Electronics* magazine for 1948 and 1949:

1. Design information on the use of two speakers for high- and low-note sound reproduction.

2. A test instrument for determining the characteristics of transistors "now becoming available from manufacturers."

3. Elements of analog computers described in a basic paper. Without fanfare, these singular items helped evidence some trends noted during the next decade.

PRESENT-DAY ELECTRONICS INDUSTRY

Today, ten years later, multi-speaker sound systems in home phonographs reproduce the full range and fidelity of fine recorded music. The "hi-fi" set competes with television for family attention.

Transistors initially promised to replace vacuum tubes — a near-sighted objective in the long run. Shrugging off the role of substitute, the transistor took on its own identity: demanded a full complement of components specifically designed for transistor applications. Of particular importance today, transistor circuits conserve space and weight, and increase the maintainability of electronic data processors and computers.

Analog computers represent one type of electronic "brain" developed to assist in the solution of complex equations. Because of their expense and rather specific function, electronic computers do not yet appear in every business office. In military and commercial pursuits, however, various types of computers affect an increasing number of lives directly or indirectly. They determine the selling price of potatoes, estimate business conditions, tabulate payrolls, and plot intercept courses for defensive aircraft. In its breadth of application to society, perhaps the computer is the one item which best represents the scope of the electronics industry.

The U. S. electronics industry today is highly complex and diversified. Its varied activities, however, can be divided into four major product groups: military electronics; consumer electronics; industrial electronics; and replacement parts. Another aspect of the industry is the import and export of electronic equipment, but, for the purposes of this survey, will not be treated because of its indirect relationship.

Military Electronics

The most important group in terms of national defense and in terms of sales volume is that of military electronics. It might also be termed government electronics since the United States government is by far the largest purchaser of electronics products and services. In 1959, sales to the government amounted to over 58 per cent of all electronics sales. This percentage includes the sum of sales to all branches of the armed forces and agencies of the government.

The military electronics field can be divided into the following areas of activity to give an indication of the scope covered: (1) research, development, test, and evaluation; (2) operation and maintenance; and (3) production. The first area represents work done in developing equipment not yet in quantity production, whereas the second covers work performed on manufactured equipment installed in the field.

Electronic equipment produced for the military services includes every conceivable type of device. Examples of the major categories are communications, radar, television, navigation aids, computers, telemetering equipment, electronic countermeasures, ground support equipment, guidance and control of missiles and space vehicles, fire control systems, and flight simulators. All of the equipment in these various categories are used to some degree in the operation of the weapons and vehicles of the army, air force, navy, marine corps, and coast guard. The largest percentage of equipment in 1959 was procured for use in aircraft, followed — in decreasing order — by missiles, communication systems, ships, and combat vehicles. It is predicted that after 1960 the expenditure for missile electronics will exceed that for aircraft electronics.

The armed services are becoming increasingly dependent on electronic techniques and equipment; with the expected rising defense budgets, the military electronics business will grow for many years to come. Other government agencies using substantial amounts of electronic equipment are the National Aeronautics and Space Administration and the Federal Aviation Agency.

Consumer Electronics

The oldest segment of the electronics industry, consumer electronics, experienced a major boom in 1959 as shown by a 21 per cent gain in sales over 1958. Black and white television sets accounted for the largest portion of the total output with color TV occupying a minor part of the total. Gains have been reported in the purchase of home radios. The output of phonographs, including hi-fi and stereo, has also increased. Other items in the consumer category include tape recorders, electronic organs and miscellaneous devices, such as garage door openers, toys, and automobile headlight dimmers.

Industrial Electronics

A segment of the industry which has tremendous growth possibilities is that of industrial electronics whose sales in 1959 increased 14 per cent over 1958. A number of factors, such as increasing research and development, modernization of plants, and reducing production costs to meet foreign competition, all tend to indicate greater use of electronic equipment by industry.

The largest portion of total production in this industrial category occurred in electronic data processing equipment, also called electronic accounting machines. Test and measuring instruments, closely related to research and development spending, are second in importance in this category. Other products in this field are industrial controls, air and marine navigation, microwave communication, broadcasting, land-mobile communications, commercial sound, medical electronics, tape recorders, nuclear electronics, theater television, traffic controls, and electronic heating.

Replacement Parts

An important fraction of the electronics business is replacement parts which includes receiving tubes, picture tubes, and other components. This category of business continued to expand in 1959 by 6 per cent over 1958. An ominous trend in the replacement parts business, however, is the increase of transistorization which could eventually reduce consumer use of replacement parts.

The production of vacuum tubes, including power and special purpose tubes, increased appreciably in 1959. Military demand for microwave tubes, especially klystrons and traveling wave tubes, is a big factor. Semiconductor output has increased appreciably and is expected to grow even more in the future. The increased production of transistors and semiconductors reflects a trend toward transistorization of electronic consumer and industrial equipment plus increased specifying of transistor components in military equipment contracts.

TYPICAL RESEARCH, DEVELOPMENT AND PRODUCTION

A Melpar flight simulator, while illustrating only one facet of military electronics, at once reflects the comprehen-

(Continued on page 66)

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VOC-ED IN THE YEARS AHEAD

(Concluded from page 30)

co-operative effort to ameliorate the situations reported in many cities.

Re-educating Workers

As the character of jobs in industry continues to change new and different manpower requirements continue to challenge employers and the schools. It is a waste of human resources in time of need as well as immeasurable personal tragedy when there continues to be permanent displacement of skilled workers whose jobs are lost because of great scientific and technical advances. Programs will undoubtedly be developed for the retraining of such persons to re-enter the labor force. Others will provide new learning opportunities for skilled craftsmen who desire a change of occupation to a type of work requiring higher skills and knowledge.

Greater attention will be paid to the organization and level of related instruction for apprentices thus to enable them to prepare themselves adequately for jobs which have been affected by advancing technology. These and other developments will call for the development of new and specialized extension-type courses for older youth and adults in increasing numbers. More and more of these courses will be taught by instructors who are regularly employed elsewhere who will offer their after-work hours to the schools. Rarely will these teachers have had any preparation or experience in shop, laboratory, or classroom teaching. To insure the most effective instruction there will be improved formal teacher-training programs which are adapted to this class of teacher personnel, as, for example, courses offered by correspondence, concentrated pre-employment teacher education conducted at the expense of the employing agency, and more institutional itinerant in-service teacher improvement on a planned basis.

In some situations where occupational practices are changing constantly, particularly in the fields of industry and agriculture, the need for improving the technical competence of teachers will be acute. Arrangements which permit teachers to assemble at established centers for intensive refresher courses will do much to bring up-to-date instruction to students in the less populated centers.

V-E for World Superiority

The great struggle for superiority among countries and the universal desire for peace will continue to exist. The United States has been undisputed leader in production of goods and services for its people and they enjoy the highest standard of living in the world. Other nations are now challenging this superiority. This will require of us a great productive effort. This demands the best of education and training for every person. Vocational education undoubtedly will play a large part in bringing about this desirable end.

As in 1914 it can be said today that, "While many different kinds and grades of vocational education will always be required, the kind most regularly demanded at the present time is that which will prepare workers for the more common occupations in which the great mass of our people find useful employment." To do this effectively educators will take cognizance of the changes which have occurred affecting work and the preparation for work, and redirect their effort to promote and further develop vocational education so as to serve greater numbers of people more adequately.

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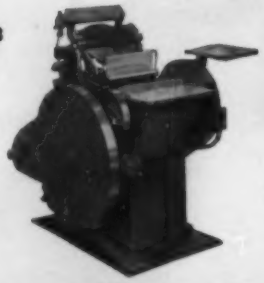

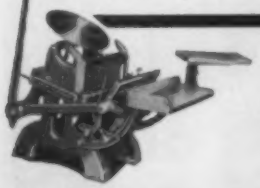

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What You Should Know About Shop Teacher Liability

DENIS J. KIGIN

- Growing settlements from teacher negligence demand an awareness by **stop teachers of the consequences of liability suits.**
- This review of the nature and extent of shop teacher liability **analyzes the rights of the pupil, district, and teacher . . .** and **considers the causes and remedies** of pupil accidents.

One bright sunny morning not too long ago an industrial arts student in a midwest high school was diligently turning a bowl on a wood turning lathe. He could have been any one of a thousand youngsters performing the same operation in any part of the country. As it was, this particular student was soon to become a statistic. The lathe tool hit an imperfection in the wood, throwing the handle into the boy's abdomen. There was no bloody wound, not even a puncture. He was taken to the hospital and six days later was dead. The pain in his abdomen had developed into paralysis of the intestines. The date: April 24, 1959.

An isolated incident? Hardly! The National Reporter System contains many cases that have started out just as this one did — and there are countless others which are not on record nor were ever litigated.

It is important that teachers be made aware of these facts, not only in consideration of the physical well-being of their pupils, but also because of the grave consequences which may stem directly or indirectly from an accident. In addition, teachers should be cognizant of the circumstances under which liability suits have been filed and the legal framework which governs a teacher's responsibilities.

Analyzing the Problem

There is growing speculation among public school teachers in general and among shop teachers in particular with regard to possible liability for pupil accidents. A suit was filed April 8, 1960, against the Phoenix, Ariz., School District and the board of education in the amount of $100,000 for an accident which had occurred in a high school chemistry lab on March 25, 1958. In the complaint, the plaintiff charged that the teacher, as a representative of the school district, was negligent in assigning him to clean test tubes under unsafe conditions. An explosion resulted, permanently scarring and disfiguring the plaintiff.

The amount of this suit is not exorbitant when compared with others of a like nature. In a well-publicized case in California, an injured high school football player brought suit against, and obtained judgment from, the school district in the amount of $325,000, which was later reduced to $118,196.[1]

[1] *Welch* v. *Dunsmuir Joint Union School District*, 326 P. (2d) 663.

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What implications do these facts have for shop teachers in the public schools of our nation? What can be done to prevent a public school teacher from being sued for a like amount?

In order to analyze this problem more intelligently, it should be viewed from three main aspects. These include: the rights of the pupil and his parents or guardian; the rights and responsibility of the school district, and the rights and responsibility of the respective teacher.

Teachers and administrators are not always aware of what their legal responsibilities are, although it is common knowledge that responsibility to the pupils is shared by the teacher and the school. The legal status of teachers is not always clear, and, in fact, is often clouded in obscurity by false notions and hearsay.

In ascertaining the nature and extent of shop teacher liability, the rights of the pupil and his parents or guardian, and the rights and responsibility of the school district will be briefly reviewed — primarily to establish the position of the individual teacher. The relative position the shop teacher occupies with regard to liability will be explored from several angles.

The Pupil

The children of most states are required by law to attend school between the ages of eight and sixteen, and are obligated to abide by the rules and regulations of a given school. However, it should not be presumed that these children voluntarily subject themselves to hazards. Expanding programs of a technical nature, in which pupils are permitted, or required, to operate potentially dangerous machinery, are bound to increase the hazards to the pupils and to increase the chances of liability of those responsible for them.

It is not practical to shield children so completely that educational activity programs are curtailed, nor is it possible to make the educational activity programs absolutely free from accidents. It is practical, however, to make school life free from unnecessary harm to children.

Although contributory negligence on the part of the victim is a defense to the charge of the plaintiff or party suing, and usually bars recovery unless the plaintiff's conduct did not expose him to any foreseeable risk of the particular injury caused by the defendant's negligence — it is complicated by the realization that minors are not held to the same degree of care that is expected of adults. Minors may be held only to that degree of care which would be determined as standard for average children of their own age.

The size or magnitude of the risk is an important matter, for when a pupil assumes some risk in a school shop, he does not assume the risk of defective equipment, incompetent instruction, or inadequate directions to accomplish some act beyond his capabilities. Assumption of risk is the principle of the plaintiff being aware of the risk involved and making a voluntary choice to encounter it. In its true and practical meaning, assumption of risk assumes knowledge of the danger and the extent of its complications. This is another defense that is open to the defendant in some circumstances, and may negate liability, but the

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courts are prone to apply it in special or unusual situations only. The defense of assumption of risk is rarely successful in a suit brought by an injured pupil against a teacher.

From these facts, it might be interpreted that since pupils are minors, they enjoy a certain immunity from the law in regard to their own negligence as applied to liability from accidents. It is imperative that teachers of shop subjects be aware of this and take the proper precautions.

The School District

School districts act under the jurisdiction of both *common law and statutory law*. The basis for common law or governmental immunity as it is often referred to, comes from the reasoning handed down in England in the Middle Ages, which stated in principle that "the king can do no wrong." From this theory evolved the principle that the state representing the king, is sovereign, and can do no wrong. The state, therefore, cannot be sued without its consent. Since the school district is a division of the government and the school board an agency of the state, they are therefore immune to tort or legal wrong.

Many courts in the United States have continually accepted the non-liability of school districts and have emphasized through their decisions, that no school district can accept liability voluntarily and waive its immunity. This immunity from liability of school districts and their officers makes it extremely difficult in most states for persons to recover damages for injuries resulting from the negligence of improper acts of school officers. Considerable hardship is often suffered by innocent pupils, school employees, and other citizens because of the principle of governmental immunity.

There are authorities in the field of school law who believe that the law of governmental immunity as applied to school districts, is old, obsolete, and unjust. This rule remains generally throughout the country, which means that in nearly all states, boards of education or school districts cannot be held liable for an accident in the school. Governmental immunity of school districts has the potential to increase the susceptibility of teachers to suit resulting from accidents in the school, and can be abrogated or modified only by direct statute or changed judicial interpretations.

Statutory law consists of the statutes enacted by the legislature of any sovereign state. It is probably that in a state which by statute allows the school district to be sued, injured pupils and their parents would be less likely to bring suit against individual teachers. This is not in any way to be construed that teachers are relieved of their responsibilities by statute.

School districts operate within the framework of statutes relating to education and passed by the legislature. When legislation covers the subject in dispute, it becomes the dominant factor in the law of that particular state with which the legislation is concerned. A statute is the result of an act of the legislature and is so recorded.

Statutes cannot anticipate all problems school boards face, with court decisions then becoming useful as sources of information. Although court decisions do not have the effect of binding laws, and are not always in agreement, they do indicate trends. They also serve as criteria in cases where doubt exists and become guides to action.

The legislatures of a few states have passed laws requiring or permitting school boards to reimburse employees who are held liable for injuries resulting from negligence. These laws are called "save harmless" laws and provide that each school district shall protect and "save harmless" its employees from any loss during the course of assigned school duties. According to the laws, reimbursement is possible only if the negligent act complained of was one that the employee undertook while acting in the due course of his employment. Five states now have "save harmless" laws including Connecticut, Maine, New Jersey, New York, and Wyoming.

The law requires school districts to maintain certain standards with regard to educational facilities. These standards are not consistent in all states, but there are common factors which meet with a certain degree of agreement. An example of this is the acceptance of the duty of the school district to provide properly guarded equipment. It is the responsibility of school authorities to provide school shops with good quality machines and tools, equipped with adequate guards that at least meet the standards of the state department of labor and industry.

Failure to provide safety equipment was held by a New York court as negligence on the part of the district.[2] In ruling on this case, the court emphasized the fact that the legislature of the state did not intend for children in schools to be subjected to danger of serious injury because of a lack of adequate equipment. The court ruled for the plaintiff and called attention to the interpretation of the law which makes it the duty of the board of education to provide equipment that might be necessary for proper and efficient direction of educational activities.

The Teacher

The public school teacher, by virtue of his position and by reason of his assigned duties, assumes a degree of responsibility for the welfare and safety of the pupils in his charge. The fundamental principle of the teacher's relationship with pupils is contained in a legal phrase, "in loco parentis," which means in place of the parent. Under this concept, the teacher has some of the rights and duties of the parent and in the faithful discharge of such duties, is bound to use reasonable care, tested in the light of this relationship.

The feelings of the courts with reference to the principle of "in loco parentis" are well illustrated in the decision handed down in the case of Brooks v. Jacobs.[3] The court, in finding for the plaintiff, ruled that the defendant teacher was negligent in his relationship to the plaintiff, and did not act as a reasonable and prudent parent would act under similar or the same circumstances.

A teacher of adolescents is presumed to know the deviations of the minds of the pupils and can be expected to anticipate their actions and keep them from unexpected difficulties by direct supervision. In actual practice, the teacher is not necessarily responsible for what happens to the pupil, but is responsible for the reasonable consequences of his own negligence.

It is evident that circumstances place the shop teacher in a vulnerable position. If a shop teacher is found negligent, he may be sued for damages which he must pay out of his own funds. A teacher is not immune from liability because he is employed by a governmental agency, but is governed by the common-law obligation that every person must so act or use that which he controls as not to injure another.

The expanded offerings that are now included in the curriculum of a modern high school are far more comprehensive than was ever thought possible. The activities that pupils engage in as a scheduled part of their shop work add greatly to the responsibilities of the respective teacher. A teacher must therefore be better prepared, and be more aware of his responsibilities to his pupils and to the community than ever before. He has a moral and legal obligation to educate the pupils

[2] *Edkins v. Board of Education of New York City*, 41 N.E. (2d) 75.
[3] *Brooks v. Jacobs*, 31 A (2d) 414.

that are entrusted to him and is responsible for making the learning processes safe for the pupils.

Teacher Negligence

Various reasons have been advanced for which a shop teacher can be held liable for pupils injured in the school shop, but a recent study,[4] has substantiated that negligence is the most common. School authorities agree that there are certain common conditions under which a teacher is likely to be considered negligent should an accident to a pupil occur. Paramount among these are:

1. Absence of the teacher from the classroom
2. Neglect of equipment
3. Lack of proper safety instruction
4. Lack of due care with reference to age and maturity of the pupils
5. Lack of insistence that proper safeguards be used.

The courts have ruled in several instances that a teacher in the public schools was liable for injury to pupils in his charge, caused by his negligence, or failure to use reasonable care.

Although it may be found in some instances that the apparent cause of the accident was carelessness on the part of the pupil, the basic responsibility rests with the teacher. When school shop accidents cause medical expense, it may be expected that parents may sue for damages. If the facts absolve the teacher of negligence, he will not be held. The assumption then is that negligence is the key to teacher liability.

Proximate Cause

A shop teacher is liable for injuries sustained by pupils in a school shop if the negligence of the teacher is found to be the proximate cause of the injury. Proximate cause is the direct or immediate cause of the injury. If the circumstances surrounding an accident were such that a reasonably prudent person may have foreseen the consequences, the cause is proximate. It may be said that an act is the proximate cause of an injury if it would have resulted in the injury without the intervention of unforeseen circumstances or independent causes.

It is understood that the violation must be of a right which the law expressly recognizes and protects. Not all rights to which persons are morally and equitably entitled are so recognized and protected. If the law were a perfect instrument of justice, it could be expected that moral rights and legal rights would be synonymous. An action of tort against a person can be maintained only for the infringement or violation of legal rights.

American laws of negligence are based upon the theory of precedent, previous judicial decisions, or established modes of legal procedures. The fact that an accident occurs and the teacher is negligent, does not always mean that he is liable for damages. It must be proved that the negligence complained of is reasonably connected with the resultant injury before the negligent person may be held liable. A teacher can be negligent and not be held liable for damages if the negligence was not the proximate cause of the injury. It is the failure to plan for probable consequences that may be the proximate cause of the injury to a pupil. The key to the determination of reasonably prudent action, is the ability to foresee danger. Negligence is to be gauged by the ability of the teacher to anticipate or to foresee danger.

The test of foreseeability has been advocated as the first test to determine whether or not there has been negligence. The question then becomes, what should a reasonably prudent shop teacher foresee as unsafe conditions in the school shop and what possible consequences might result from such unsafe conditions?

Strict Supervision Needed

If students are to be subjected to potential hazards, the strictest supervision must be exercised if the teacher is to escape the charge of negligence. A teacher would be considered negligent if he did not attempt to act for the benefit of the pupil. The shop teacher has the responsibility to anticipate danger of an accident and to remove the circumstances which may cause an accident. This is from the standpoint of safety and the physical welfare of the pupils. Should the shop teacher fail to act, he is negligent by reason of omission rather than commission, which can be interpreted as a lack of foreseeability. In addition to this and from the standpoint of legal liability, the teacher should be able to anticipate the consequences of an accident. This means then, that it is not only important for a shop teacher to foresee a possible dangerous situation, but also to be aware of the consequences of a resultant accident should the dangerous condition be allowed to exist.

When shop teachers are said to be expected to conduct themselves in a careful manner to avoid negligence, it does not imply that they are to have the pupils avoid all situations where they are likely to be injured. The practical nature of shop work would be seriously hindered, and the interpretation of industry would be unreal. Workmen's Compensation is based on the theory that there are certain unavoidable accidents and injuries that occur in the conduct of industry.

In establishing negligence, a judge or jury composed of laymen, weigh all of the facts of the case and determine whether or not the defendant teacher was negligent and whether or not his negligence caused the injury for which compensation is sought. Actually there is no rule of thumb for determining or predicting what constitutes negligent action in all cases.

If shop teachers are to be held liable for injuries to pupils, it may be expected that they may hesitate to make use of some of the educational tools and machines which require personal manipulation on the part of the pupils. There have been cases of liability brought jointly against the teacher and the school district, in which the teacher was held liable and the school district immune.[5] Unless school districts themselves are liable, there is the possibility of increasing pressure to bring suit against the teacher.

In a court case involving a direct action against a shop teacher,[6] negligence was charged. Action for injuries sustained by a pupil by reason of burns from an allegedly uncorked bottle of acid which spilled on the plaintiff in an unsupervised finishing room, was filed by the plaintiff in an effort to realize damages. The lower court found for the plaintiff, but the circuit court entered judgment notwithstanding the verdict and dismissed the complaint. The plaintiff hereby appealed, and the case was taken to the Supreme Court. The Supreme Court affirmed the decision of the Circuit Court and held that the plaintiff failed to prove that the teacher was negligent in his action. The teacher was hereby absolved of any liability or damages.

[4]Kigin, Denis J., "Tort Liability Affecting Shop Teachers with Provisions for Avoiding Accidents and Litigation," unpublished Doctor's dissertation, University of Missouri, Columbia, 1959.

[5]*Woodman* v. *Hemet Union High School District*, 29 P (2d) 257.

[6]*Grosse* v. *Witteman*, 62 N.W. (2d) 386.

The court did rule, however, that a teacher in the public schools is liable for injury to pupils in his charge caused by his negligence or failure to use reasonable care.

Alleviation of Liability

There has been speculation in many states whether or not a claim against a teacher can be substantiated, but court records indicate that many cases of this type have been litigated. In the majority of the states, the teachers receive no special legal protection by reason of their position. In the light of this information, it is well for teachers to realize that there are certain established agencies from which assistance can be expected in the event of a lawsuit resulting from an accident in the school shop.

The possibility of teachers being sued as a result of accidents in the public schools, has brought about a growing interest in insurance protection. Some authorities have advocated insurance as a possible solution to the problem of teacher liability. The purchase of liability insurance is usually up to the individual teacher, or vested in the authority of the respective state. It is possible in a few states for the school district to purchase liability insurance, but in most states it is not a legal expenditure.

The courts have generally held that the district is without power to spend public funds for liability insurance, unless a statute permits it. Without statutory authorization, the practice of purchasing insurance policies by a school district is an "ultra vires" (act beyond the scope of authority) expenditure of school funds. If a school district has the authority to carry liability insurance, it is recommended that a policy be obtained that gives injured parties adequate protection without first having to obtain a judgment against the district.

The type of insurance protection which seems to be growing in popularity, is the group liability plan sponsored by state education associations. It was found that 19 states now have such plans, with several others investigating the possibility. These plans are being accepted by teachers and professional educators as an equitable means of protection against the possibility of a judgment. Under a representative plan of this type, a $10,000 liability policy is included as a part of the regular yearly association dues, or for a small additional payment.

Accident Prevention

Legislation and insurance in themselves are not adequate to prevent a teacher from being adjudged liable. The shop teacher, as an individual, has the responsibility to protect himself and remain free from liability insofar as legally possible. Basically, the shop teacher should be concerned with (1) accident prevention, (2) accepted procedures should an accident occur, and (3) a standard method of accident reporting. The shop teacher's efforts should always be directed toward the prevention of accidents so that pupils will be able to work and learn safely.

A course of study, which includes adequate safety instructions, is of paramount importance in a school shop class. Only properly instructed and physically equipped pupils should be permitted to operate equipment, which in the main, involves a degree of risk. Shop teachers have the responsibility to include a form of accident prevention in their instruction. This should be an integral part of the class, and be associated directly with the operation of each individual tool and machine.

It is the duty of the shop teacher to either maintain the equipment in safe working order, or to report unsafe circumstances to the proper authority. The law says that the teacher is responsible and knows that unguarded belts and gears are safety hazards and should not allow pupils to operate equipment in such condition. In regard to the use of guards on machines, the obligation of the teacher is very evident. The guards must be in place and used when operating power machines in the school shop. If the pupils are permitted to operate unguarded machinery, without question, the teacher is guilty of negligence should an accident occur. In the use of any tool or machine where there is possibility of eye injury, safety glasses or goggles must be worn. If the teacher wears them while demonstrating an operation, the students are more likely to recognize their importance. Careful scrutiny of the tools and equipment used by the pupils, should be a regular habit of the teacher. A safe building, safe equipment, proper guards on machines, and safe housekeeping practices are all factors which control the working environment of a safe and productive school shop.

Accidents can be prevented by human alertness, which can best be achieved by careful attention to the focal points of trouble. Preventive safety education in the school shop is possible only after the basic causes of the accidents have been determined. Minor accidents should suggest instructional needs to the teacher in preventing future, serious injury involving the same type of accident.

An effective safety program would include an efficient method of recording all accidents. It is important to realize that accidents which result in minor injury, should be reported along with those which are more serious. Accident reports are of value in analyzing shop accidents and their causes, in an attempt to reduce them. A study of these reports can indicate points of difficulty, and provide clues to the danger areas.

An accident report can be of value from a legal point of view because trial may not be immediate. An accurate report of the accident compiled right after it happened is often the best defense. A more effective defense can be prepared if the attorneys are aware of all pertinent details.

When the shop teacher is called upon to leave the shop while class is in session, it is recommended that certain machines be shut off and safety locked. Injuries do occur, and it is the responsibility of the teacher to recognize situations to help pupils to avoid danger. Warning pupils of dangerous places and hazardous activity is common, but it is the duty of the teacher to insist on proper use of tools and machines.

A practice in the school shop which is of questionable merit, is the assignment of an unco-operative pupil to a responsible safety position. This is an obvious attempt to alleviate a discipline problem and stimulate interest in school work. This can prove to be dangerous and may lead to legal implications for the teacher should an accident result.

It is psychologically sound to refer to all regulations in the shop as safe practices, rather than rules. A shop teacher is duly responsible for the control of safe practices in his own situation. Violation of safe practices in the school shop, which the teacher is aware of and allows to continue, could result in the teacher being held negligent.

The effectiveness of safety instruction in the school shop, depends to a certain extent upon the interest of the teacher in making it constant and alive. He must believe in it himself before he can project it to his pupils. It is also conditioned by the training and background of the teacher and his familiarity with safety factors. Shop teachers should have a personal and a professional knowledge of their legal responsibility, and the growing importance of safety in conducting shop activities.

One of the most effective ways for a shop teacher to remain free from the fear of being involved in a liability suit is to operate a constant, efficient, and realistic safety program. He must be able to prove, beyond a doubt, that each pupil has received adequate safety instructions.

Liability Developments

There have been recent changes in state legislation and court decisions which directly affect the problem of public school teacher liability. Perhaps the most significant development to date, is the decision handed down by the Illinois Supreme Court in the case of Molitor v. Kaneland Community Unit School District, in March, 1959. In an unprecedented action, the Illinois Supreme Court overthrew and negated the doctrine of governmental immunity as applied to Illinois school districts in actions for damages for tort. In doing so, the court completely changed the legal doctrine relating to Illinois schools, and ruled that school districts are to be held liable in tort for the negligence of their employees.

Courts in the past have expressed dissatisfaction with the policy of governmental immunity as applied to schools, but this is the first record of a state supreme court abrogating the common law principle. This case has created a great deal of interest among school people, and may well motivate other states into taking similar action. Conversely, it may also stimulate some states to substantiate the common law theory of governmental immunity of school districts by actual legislation to this effect.

The law is not static and circumstances such as these give reason to believe that there may be a shift in the thinking of courts on the question of school district immunity.

Conclusions

While authorities are debating and deciding what might be the best solution to the problem of tort liability, teachers of shop subjects should put into practice a strong safety program aimed at the reduction of classroom accidents and the ultimate training of the pupils. It is not enough to depend on signs, slogans, rules, regulations, mechanical guards, and special equipment. Safety is more than this, although it is accepted that these are needed for protection.

Safety is learned by children in school, through experience, from instruction, and from example. A built-in safety program is developed in each individual as a means of survival, and is supplemented by personal effort. In educating for safety, no doubts should exist. A teacher must never drop his guard, as children are always watching, listening, and learning.

The final judgment of who is negligent and under what specific conditions, is difficult to pre-determine. Negligence is usually determined by a group of laymen, who compose a civil jury, and not by professional educators. Since laymen determine liability in court cases, the actions of the shop teacher must bear the sign of plain common sense. The public school system must be responsive to, and appreciative of, the general mores of the people. If a pupil is injured in a school shop accident, someone may be liable for damages. The school district, in most instances, is immune from liability in tort, but not so the shop teacher who becomes the logical defendant. The teacher can be held liable even though teachers can be classified as state employees, and in discharging their duties, render services for a public purpose.

Salaries of teachers in the past have not been of such nature as to encourage lawsuits against them. However, the trend toward the increase in salaries, and the resultant property holdings, could well be a factor in more school accidents resulting in litigation.

The courts are in general agreement that a school district is not liable in tort, in the absence of a statute making it liable. In the absence of a statute, tort liability rests on common-law principles and remains the law in the United States unless changed for a particular state by its state legislature. It must be emphasized that even though a school district is liable by statute, this does not relieve the teacher of his liability. A teacher can be joined in a suit, and can be held liable. It also follows that the teacher is not immune from the liability for the injury to a pupil, although he may be immune to the costs which might evolve.

Statistics have shown that accidents do occur in spite of modern safety devices and seemingly adequate safety instructions. Teachers do not guarantee that no injuries or damages will result from their acts, but they should do their utmost to keep them at a minimum. No age group is free from accidents. High school and college students lead active lives because of the exuberance with which they engage in their activities. These young people can avoid injury to themselves or others, with a little controlled thinking, and with the knowledge of how to prevent accidents. This may be termed the development of the "safety attitude."

The legal aspect of safety education does not become active until, and unless, an accident actually materializes. This can be construed in effect, that the secondary purpose of safety instruction is to prevent, or reduce the possibility of legal involvement. Low accident frequencies do not necessarily indicate the quality of safety education programs, but they may simply reflect poor accident reporting.

Teachers and administrators need to take every precautionary measure possible to reduce the chances of an accident occurring. Anything which might be done to protect teachers from damages, does not minimize the need and importance of a good safety program, excuse poor teaching practices, or condone carelessness in the upkeep of the equipment in the school shop. A well organized safety program is one that meets the moral responsibility of the teacher and the administration, and produces a program so efficient that it will insure the teacher freedom from liability. When safety instruction is at the optimum level, both pupils and teachers are protected, and there is little need for other types of insurance.

There is no need for teachers to be attorneys, or to understand all phases of law, but it is important for them to understand basically that phase of law which affects them directly. The application of the knowledge of legal liability will do more than avoid liability. It will stimulate precautionary measures to aid in the reduction of injuries to children, which are our greatest natural resource, and are never to be considered expendable. ◀

READINGS

1. Cohler, Milton J., "The Law, The Teacher, and The Child," *American School Board Journal*, December, 1951.
2. Edwards, Newton, *The Courts and the Public Schools* (Chicago: University of Chicago Press, 1955).
3. Garber, Lee O., *The Yearbook of School Law* (Danville, Ill.: Interstate Printers and Publishers, Inc., 1960).
4. Hamilton, Robert R., *Legal Rights and Liabilities of Teachers* (Laramie, Wyo.: Mountain States Lithographing Co., 1956).
5. Kigin, Denis J., "Tort Liability Affecting Shop Teachers with Provisions for Avoiding Accidents and Litigation," unpublished Doctor's dissertation, University of Missouri, Columbia, 1959.
6. Remmlein, Madaline K., *School Law* (New York: McGraw-Hill Book Company Inc., 1950).
7. Roach, Stephen J., "School District Tort Immunity Overruled," *American School Board Journal*, October, 1959.
8. Silvius, G. Harold, and Curry, Estell H., *Teaching Successfully the Industrial Arts and Vocational Subjects* (Bloomington, Ill.: McKnight & McKnight Publishing Co., 1953).
9. Tooze, Walter J., "Contributory versus Comparative Negligence — A Judge Expresses His Views," *NACCA Law Journal*, Wright and Porter Printing Company, Boston, November, 1953.

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ELECTRONICS

(Continued from page 58)

sive skills, the extensive engineering enlisted in research, development, and production of a single "product." Educators will recognize in the flight simulator a *contrived experience* which presents realistic, compound problems for solution by the trainee.

In the present concept, a flight simulator is more correctly termed a "weapons system" simulator since it re-creates not only the flight characteristics but all components of today's supersonic and highly complex aircraft. These simulated features include communications and navigational aids, radar, fire control, and weapons, in addition to the aerodynamic and engine characteristics of the actual aircraft.

The ever-increasing speed and complexity of military aircraft (weapons systems) demands a greater number of faster and more accurate responses from flight personnel. Preparation of flight personnel to meet these stimulus-response situations, requires the right kind of practice to make perfect. However, when actual aircraft are used for this training, the expense becomes excessive and the risk to personnel considerable. The mission of the simulator is to realistically present the weapons system in a simulated environment for the purpose of training personnel economically and safely. To insure the ultimate in realism, the trainer cockpit duplicates the cockpit of the aircraft simulated except that the various controls and switches are connected to electronic computers. These computers translate the actuation of controls and switches by the aircrew into physical reactions of the simulator and indications identical to those which would occur in actual flight.

Experienced instructors monitor the performance and reactions of the aircrew while responding to the various training disciplines. This is made possible by equipping the instructor's consoles with repeater instruments and indicator lights to show the position and movement of the various controls in the cockpit. The instructor's consoles are also provided with switches which may be used to cripple many of the functions of the aircraft systems. For example, an instructor may "fail" the landing gear system, thus preventing the pilot from raising or lowering the landing gear by using normal procedures. The instructor then monitors the actions of the pilot as he attempts to actuate the landing gear, first by using normal procedures and then emergency procedures. Any errors made by the pilot in performing these procedures endanger neither his safety nor that of his aircraft, and the proper corrective action is brought to his attention by the instructor.

Before a simulator can be built, however, much research and development must be accomplished to insure realistic and accurate response of the many varied systems comprising a particular weapons system.

(Continued on page 68)

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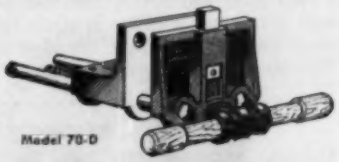
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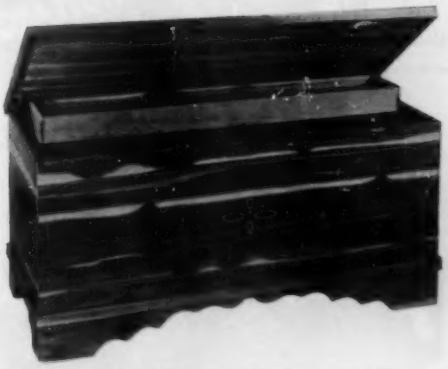

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ELECTRONICS

(Continued from page 66)

Research and Development

Melpar research and development groups function as an integrated team under the leadership of a project manager (project engineer) who has the over-all technical responsibility. The project manager is also responsible for technical liaison with the weapons system contractor, the procuring government agency, and the specialized groups under his direction. These specialized groups include the aerodynamic flight systems, instrumentation, radar and flight control, and the radio aids and navigation groups.

The aerodynamic group — mathematicians and aerodynamicists — convert wind tunnel, flight test, and engine data received from the aircraft manufacturer into the applicable form for use by the specialized systems groups.

The flight systems group consists of mechanical and electrical engineers and engine specialists who design the electronic computers and servo-mechanisms which translate the movement of the flight and engine controls into realistic aerodynamic responses.

The instrumentation group works closely with the flight systems group in preparing the cockpit instruments to receive the output from the various electronic computers and to respond exactly as they would in the aircraft. This group also insures that the cockpit controls produce exactly the same response in the simulator as in the aircraft. The feel or touch of the controls for the aircrew must be identical with that which they will experience when operating the actual aircraft.

The radar and fire control group designs the electronic equipment required to simulate accurately the various radar displays and fire control responses. This includes contrived encounters with "enemy" aircraft capable of evasive tactics.

The radio aids and navigation group designs the communications, radio aids and navigation circuits to function exactly as in the aircraft. In many cases, authentic equipment is used but modified to operate from data generated by servos and computers. In addition, the group designs the electronic components required to realistically simulate control tower communications, direction finders (DF), instrument landing systems (ILS), and ground controlled approach systems (GCA).

Each forementioned group is involved in the physical simulation of sight, sound or motion in so far as the group's own area of design is concerned.

Additional groups, such as the drafting department, machine shops, etc., furnish support services throughout the entire project until the prototype simulator is completed and ready for testing by the customer. Upon acceptance of the prototype by the procuring government agency, engineering release of data and drawings to the production division initiates manufacture of the required number of simulators.

progress of Title VIII

The simulator production and quality control department collaborate to insure that the customer receives a well-built, high-quality product. Manufacturing facilities are under the supervision of a production department head who is responsible for keeping the job on schedule and the costs within budget. His over-all supervision covers activities of the production engineering group, the planning and control group and the wiring and assembly group.

The production engineering group includes electrical and mechanical engineers as well as supporting technicians and draftsmen. This group monitors the equipment through construction and test phases, and when required, prepares engineering change proposals to ease production difficulties or improve the end product.

Planning and control administers the production program. The responsibilities of this group include requisitioning the required material for manufacture of the simulators and insuring that all schedules meet the contract requirements.

The wiring and assembly group, as its name implies, installs equipment and makes necessary electrical connections. Included in this group, a methods engineering section prepares assembly and process instructions, cable boards, assembly fixtures, and other manufacturing aids.

Production support embraces an industrial engineering section and other

(Concluded on page 70)

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ELECTRONICS

(Concluded from page 68)

manufacturing facilities: sheet metal shop, machine shop, plating and finishing shop, and the printed circuit shop.

The quality control department has the primary responsibility for insuring maintenance of the customers' required quality level. This group designs or adapts special test equipment required for production test and prepares detailed test procedures for shop inspectors. Quality control acceptance tests are performed at all levels and phases of simulator construction from component to subassembly to subsystem to system. Upon passing the final system test the simulator is packaged and shipped to the designated field location.

Field Service Division

As indicated previously, the Melpar field service division provides worldwide technical support for Melpar equipment. It performs engineering, supply, and management functions as required for optimum utilization of that equipment in the field.

CONCLUSIONS

From the foregoing description of Melpar and a "typical" large-scale project an implied pattern emerges of manpower utilization within the electronics industry. Primarily the industry profile appears as a high ridge or backbone of top talent flanked by plateaus of technical or mechanical skills. Some of the scientists and engineers specialize in concentrated areas of electronics. Others find equal demand for their training and intellect in allied industries. Melpar, for example, maintains a sizable and very essential staff of chemists in its physical sciences laboratory. Similarly, the construction of electronics hardware requires mechanical as well as electrical engineers.

Future funding by the government depends largely on the world political climate. To maintain the security of our nation, military electronics expenditures approached 500 million dollars in 1950; the present spending rate is about five billion a year — ten times greater. Estimates place the military electronics market at 12 billion dollars by 1970. ◀

ACKNOWLEDGMENTS

Much material for this article was obtained from the following sources:

Electronics (magazine) (New York: McGraw-Hill, 1948, 1949, 1955, 1960).

Essentials of Radio, by M. Slurzberg and W. Osterheld (New York: McGraw-Hill, 1948).

United States Army in World War II: The Signal Corps, by D. Terrett (Washington, D. C.: U. S. Government Printing Office, 1956).

Radar System Engineering, by L. N. Ridenour, Radiation Laboratory Series, Vol. 1, Mass. Inst. of Tech. (New York: McGraw-Hill, 1947).

The authors also wish to credit R. F. Rundell, Melpar technical writer, for assistance in describing a Flight Simulator project.

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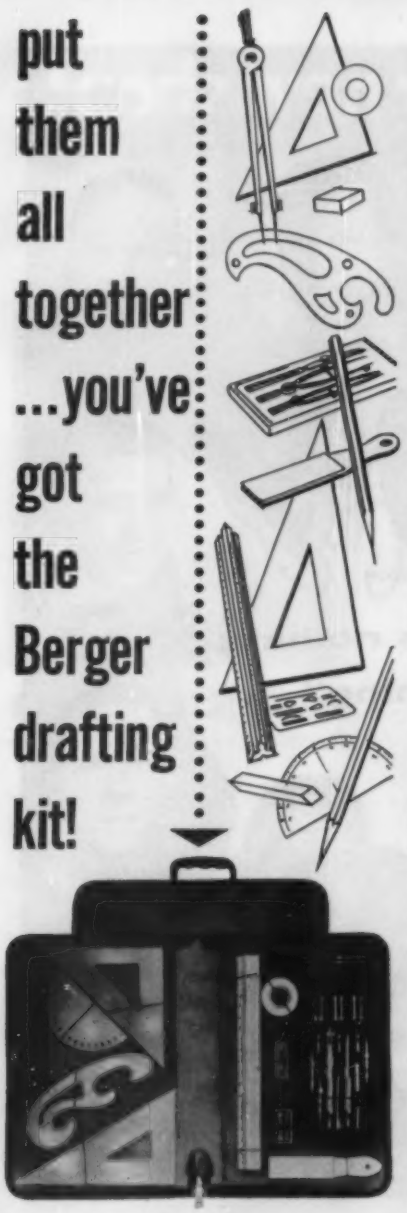

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There are sections on various types of woods; furniture design; woodworking machines; machine tool processes; cutting to irregular shapes; assembling stock; and preparing woods for finishes and methods of applying them.

Included are lists of films and reference books and pamphlets. An objective test divided into sections corresponding with those in the book is furnished free with each copy.

Creative Metalworking

By E. B. Mattson. Cloth, 121 pp., 6⅜ by 9½ in., illus., $3.25. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

Persons wishing to express themselves by working with metal will find designs and ideas in this book to help stimulate creative thinking, and planning and making beautiful articles for the home. Beginning with the first chapter on getting started the author points out the necessary and logical steps in selecting and designing a project, drilling, metal cutting, etc., and follows with a presentation of 36 products to be made.

Understanding Radio

By Herbert M. Watson, Herbert E. Welch, and George S. Eby. Cloth, 706 pp., 6¼ by 9¼ in., illus., $6.20. McGraw-Hill Book Co., Inc., New York, N. Y.

A comprehensive but easily understandable textbook, this third, revised edition is for students with little or no background in electricity or science.

Mathematics in the book is kept to a minimum; what is required is explained in the simplest terms and is kept practical.

Visual teaching has been emphasized. There are five hundred drawings in the book, all done by one of the authors (Welch). The lists of definitions of technical terms included at the end of each of the first several chapters provide a further aid to the reader.

In this edition, several new circuits, tubes, applications, and principles have been introduced, including public-address units, intercommunication units, the phase-inverter circuit, many new tubes, new power supply circuits, frequency modulation, and a new chapter on transistors.

Exploratory Electricity

By Joseph P. Arnold and Kenneth L. Schank. Paper, 104 pp., 7⅝ by 10¼ in., illus., $1.25. McKnight & McKnight Publishing Co., Blomington, Ill.

A text designed for junior high schoolers, this workbook provides an introduction to the study and use of electricity. Chapter headings are indicative of the content: "Occupations in Electricity," "Magnetism," "Producing Electricity," "Working with Electrical Circuits," "Electrical Machines," "Resistance to the Flow of Electricity," "Electricity in the Home," and "Communicating with Electricity."

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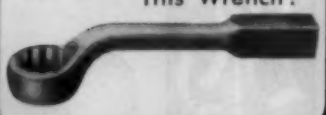

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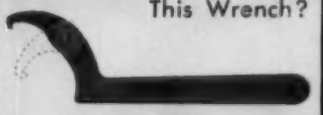

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By Philco TechRep Division, Philco Corporation, Philadelphia, Pa. Cloth, 8¾ by 11¼ in., first volume, 235 pp.; second volume 179 pp.; third volume, 188 pp., each $6; illus.

For student, technician, and engineer, this three-volume textbook presents a thorough elementary treatment of the fundamental principles of electricity and electronics.

Volume I explains basic concepts and their application to d.c. circuits; II, a.c. circuits; and III, electron tubes and semiconductors.

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Improving Safety Education Program in School Shops

by Howard K. Hogan. Circular 616—1960. Paper, 48 pages. Price 35 cents. U. S. Office of Education, Washington 25, D. C.

This book analyzes accidents in employments relating to the subjects taught in school shops and recommends a series of preferred safety practices for school shop teachers under the headings of (*a*) safety inspection, (*b*) instructional techniques, (*c*) safety equipment, (*d*) practices to assist personal protection, (*e*) good housekeeping and cleanliness, (*f*) electrical safety, (*g*) accident reports, and (*h*) first aid practices. The bulletin recommends a safety inspection check list and standardized reports.

Manufacturing in the School Shop

By Robert W. Haws and Carl J. Schaefer. Paper, 72 pp., 5⅜ by 8¼ in., illus., $1.10. American Technical Society, Chicago, Ill.

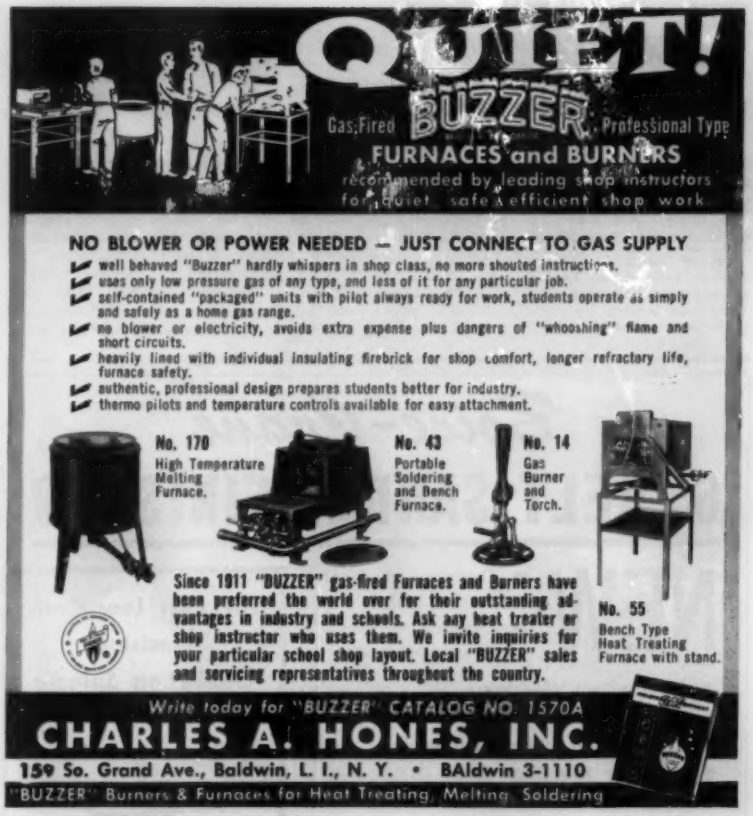
The purpose of this book is to familiarize the student with modern production line techniques. There are seven sections, each designed to stimulate thought on a specific phase of manufacturing. The text begins with a discussion of the history and importance of manufacturing, and is concluded with a section entitled "The Business End," which covers such aspects as pricing, bookkeeping, and distribution. The middle part covers "what to make," "how to make it," "production methods," "plant layout," and "personnel."

The book contains a suggested projects list including tools and equipment needed and procedure, and bill of materials for each. A bibliography is furnished; also assignment sheets.

Research in Industrial Arts Education

Edited by Raymond Van Tassel. Cloth, 123 pp., 6¼ by 9¼ in. Ninth Yearbook (1960) of the American Council on Industrial Arts Teacher Education. Produced and distributed by McKnight & McKnight Publishing Co., Bloomington, Ill.

An interesting and valuable collection of papers concerning the purposes of research in the field of industrial arts education as seen by each author of its seven chapters, and summarized by Dr. Van Tassel.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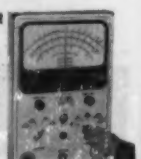

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Of the 163 colleges responding in this study, 20 indicated they offered no electrical instruction to their prospective industrial arts teachers. Some colleges required courses in electricity with the median number of semester hours required being 3.57. One school reported 15 semester hours in electricity as being required. More than one fourth of those colleges reporting did not require their industrial arts majors to take course work in electricity and electronics.

Sixty-three of the 134 colleges offering electrical instruction offered only one or two courses. The median number of semester hours offered was 6.24 with one college reporting 56 semester hours. Some schools indicated they were planning to add courses in electricity and electronics, but these were in the minority.

The study then sampled selected companies in the electrical manufacturing field to ascertain the items of electrical knowledge they felt were required of persons who work with electronic devices.

A detailed report of these requirements can be obtained by writing Dr. H. H. London, Department of Industrial Education, University of Missouri, Columbia, Mo.

Mr. Jelden reported that industry unanimously agreed that "required" knowledge for electronics technicians included: Lenz's Law for opposing fields, electromagnets; symbols for electrical units; purpose of circuit diagrams; voltage; current and resistance in series; parallel and series-parallel circuits; Ohm's Law for DC and AC circuits; prefixes for notations — centi, mega, milli, micro, kilo; units of measurements; voltmeter and ohmmeter operation; characteristics and use of transformers; what capacitance is and what it does; operating theory of vacuum tubes; function of plate in vacuum tube; diode as a rectifier; and common tubes in power supplies. Also included as "required" knowledge were: semi-conductors and transistor circuits; frequency modulation; FM receivers; FM transmitters; discriminators; and thermistors.

Informational unit blocks which were rated as "required" knowledge for technicians were: d.c. and a.c. circuits; filters and filtering action; operation and use of rectifiers; theory and application of amplifiers; principles of receiver operation; principles of transmitter operation; theory and function of oscillators; amplitude modulation and the principles of signal detection.

An examination of books in use at the time of the study revealed that few dealt in any great detail with the theory and application of recent developments in electricity and electronics.

Colleges and universities should take immediate action to make available at least a minimum offering in electricity and electronics.

Teacher education institutions not requiring electrical instruction for their industrial arts majors should immediately extend their requirements to include these activities.

Industrial arts teacher education institutions should offer instruction involving the operating theory and application of transistors and semi-conductors which are now so widely used in industry.

A study just completed by Mr. George Brown[2] and available for distribution from the University of Missouri, points out the electronic equipment needed and the manipulative operations performed in industrial arts teacher education programs based on industrial electronic practices.

[1]Jelden, David L., "Electrical Informational Content Included in Industrial Arts Teacher-Education vs. Knowledge Required of Electronic Technicians Industry," a study conducted at the University of Missouri, 1960.

[2]Brown, George, "Manipulative Operations Performed and Electronic Equipment Needed in Industrial Arts Teacher Education Based on Industrial Practices," Ed.D. Thesis, University of Missouri, 1960.

— William Spence
Associate Professor of Industrial Education, Western Michigan University, Kalamazoo

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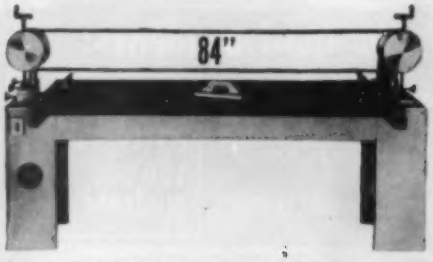

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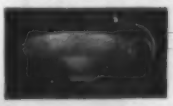

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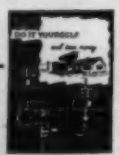

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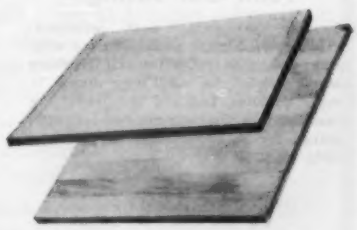

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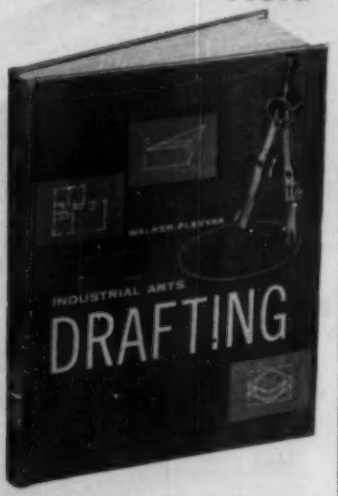

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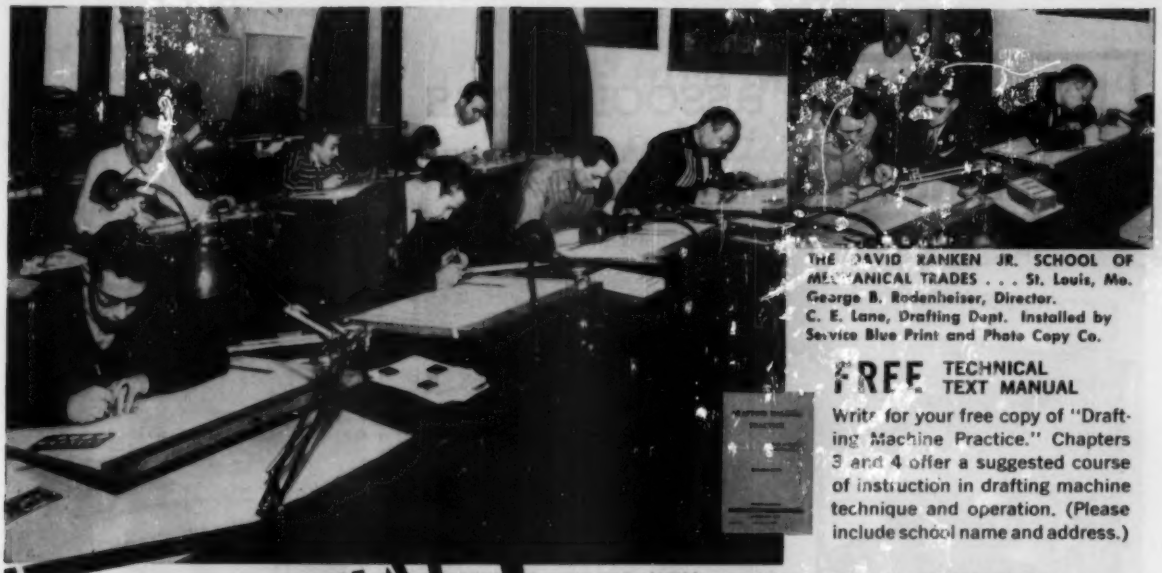

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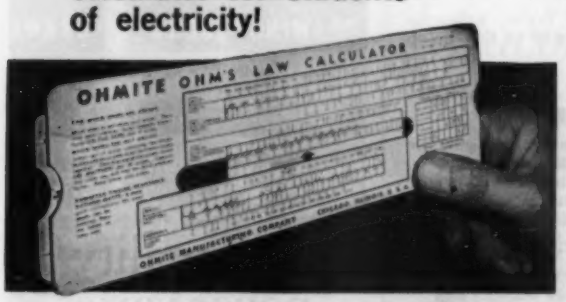

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MISSOURI TEACHERS HOLD SPRING CONFERENCE

The Annual Spring Conference on Industrial Education was held in Columbia, Mo., on April 8 and 9, 1960. The attendance was made up of about five hundred industrial education teachers, representing industrial arts, day trade, part time cooperative, apprentice, practical nursing, and technical education.

At the conference, the Missouri Industrial Education Association elected their officers for 1960–61. They are: president, Doyle Kemper, head, industrial education department, Southwest Missouri State College, Springfield; vice-president, Robert Kaintz, machine shop instructor, O'Fallon Technical School, St. Louis.

The date for the 1961 Spring Conference has been set for Friday and Saturday, April 14 and 15. — *Maurice L. Stewart.*

NEW OFFICERS ELECTED

At the spring meeting of the New Jersey Industrial Arts Association, held at Asbury Park, N. J., on March 17 to 19, the following men were elected to office:

David S. Enslee, Mountain Lakes, president; Stanley Grossman, Springfield, first vice-president; F. W. Christoffel, Elizabeth, second vice-president; Nelson Beebe, Jr., Pennsville, treasurer; and George B. Traub, Pitman, secretary.

PRINTING TEACHERS HOLD CONFERENCE

The 35th Annual Conference on Printing Education of the International Graphic Arts Education Association was held in Houston, Texas, during the week of August 14 to 19, 1960.

Professor S. Wayne Taylor, University of Houston, was chairman of the conference program.

FALL-INSTRUMENT-AUTOMATION CONFERENCE

Arrangements are being completed for one of the largest internationally recognized scientific and industrial events of 1960 — the Fall Instrument-Automation Conference and Exhibit of the Instrument Society of America, together with the Society's 15th Annual Meeting. It will be held in New York City during the week of September 26 through 30.

The theme of the Conference and Exhibit is "Progress Through Instrumentation." Papers and discussions at the sessions will cover subjects concerned with instrumentation in aeronautics, meteorology, nuclear instrumentation and underwater instrumentation, in addition to a complete range of industrial instrumentation.

COMING CONVENTIONS

Oct. 7–8. Ohio Vocational Association, at Southern Hotel, Columbus, Ohio. Exhibit chairman, C. O. Tower, 3520 Central Parkway, Cincinnati 23, Ohio.

Oct. 14–15. New England Industrial Arts Teachers Association, at Wentworth by the Sea, New Hampshire. Secretary, Edward P. Stach, Warren Harding High School, Bridgeport 10, Conn.

Dec. 5–9. American Vocational Association, at Los Angeles, Calif. Secretary, M. D. Mobley, 1010 Vermont St., N.W., Washington 5, D. C.

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appointments . . .

▸ *Arthur F. Ahr,* associate in industrial arts education, appointed acting chief of the Bureau of Industrial Arts Education, New York State Education Department, effective March 10, 1960. He succeeds *Roy G. Fales* who retired December 31, 1959.

▸ *Ralph C. Bohn,* associate professor of industrial arts, named acting head of the industrial arts department at San Jose State College, San Jose, Calif., to succeed *Robert J. Moore,* dean of sciences and occupations, acting head of the industrial arts department since the death of *Heber A. Sotzin* in January, 1960.

▸ *C. Nelson Grote,* who for the past two years has been studying toward the doctorate at the University of Illinois, has recently accepted a position at Morehead State College, Morehead, Ky., as chairman of a new Division of Applied Arts, with teaching responsibilities in industrial arts education.

▸ *Raymond Cherry,* is head of the industrial arts department at Lockport, Ill., Township High School. He received a B.S. degree from Parsons college, Fairfield, Iowa, and a M.A. degree from the University of Missouri in 1934.

▸ *Charles F. Green,* who for the past 13 years has been a machine drafting teacher, head of the drafting department for seven years, and evening school principal for five years at the Middlesex County Vocational and Technical High School in New Brunswick, N. J., has recently been appointed director of vocational and technical education in Warren County by the board of education of the vocational schools in the County of Warren. He will be responsible for the promition and development of a vocational-technical program there.

▸ *Jack Smith* is assistant professor and head of the Trade and Industrial Education Department, Mindanao Institute of Technology, Kabacan, Cotabato, Philippines.

George F. Henry, who retired a year ago as head and professor of industrial arts at Colorado State University to go to Pakistan in September, 1959, as a Fulbright lecturer in education working with the schools in West Pakistan offering technical education, has now joined the Oklahoma State University Technical Education Program (Ford Foundation) as teacher trainer, and will be at the Kovachi Polytechnical Institute in that capacity until November, 1961.

retirements . . .

▸ *Floyd Keith,* head of the department of metalworking and professor of industrial education, at Stout State College, Menomonie, Wis., retired at the end of the school year, after 38 years as a member of the faculty.

▸ *Aubrey Porter,* who recently received an honorary life membership in the New Jersey Industrial Arts Association, having been teaching industrial arts for 43 years, and who was serving as department head at Junior High School, Long Branch, N. J., retired at the close of the school year.

Harold Shannon, department head at Asbury Park High School, Asbury Park, N. J., retired at the close of the school year after having served as industrial arts teacher for a period of 43 years. An honorary life membership in the New Jersey Industrial Arts Association was conferred on him recently.

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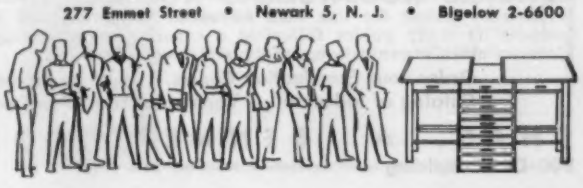

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notebook

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Modern, ready-to-use wood glues have made the task of forming permanent joints in wood virtually foolproof. The right type of glue, properly used, will enable one to assemble pieces easily so that joints will never work loose, even under rigorous conditions of outdoor use or under heavy loads.

Glue is an indispensable item in the making of useful wooden articles. While glue, like nails or screws, is a fastener, a nail or screw fastens at one point only and glue holds over the entire surface of a joint and can weld wood together so that a glued joint is actually stronger than the pieces of wood to which it is applied. The strongest known means of fastening wood together, glue also spreads in a uniform film that firmly binds together every part of the surface to be joined. It provides joints that can resist high stress and violent shocks and that permit the combining of wood into economical thicknesses and into useful and ornate shapes otherwise impossible.

Glue suitable for wood joints and veneers is usually sold by hardware stores, paint stores, lumberyards, and building-supply houses. Do not make the mistake of buying mucilage, paste, or cement which, although suitable for gluing paper, cardboard, or crockery, will not make a permanent bond on wood.

Successful wood gluing calls for attention to details and the use of the right type of glue for the particular job on hand. No one glue can do all the jobs equally well, hence the variety of different kinds available. Some are ready mixed, while others must be mixed immediately before use. The wood glues that the student woodworker and the home handyman will be most likely to use will fall into one of the following general categories: liquid animal, casein, plastic resin, white polyvinyl, resorcinol, and contact cement. These are all described in the following chart along with the principal characteristics of each.

Rules for Gluing

Aside from using the right glue, there are five simple rules to follow if strong, neat-looking wood joints are to be assured:

RULE No. 1. Be sure to mix and use the glue exactly according to the manufacturer's printed directions. With those glues that have to be mixed be careful to measure quantities exactly — never guess. When specific temperature limits are given, do not work in situations which are colder or warmer than the maximums or minimums listed. Temperatures of around 70 degrees are ideal for most wood glues.

RULE No. 2. Be sure all joints are clean and dry before any glue is applied. For maximum strength the glue should be able to penetrate into the porous surface of the raw wood. Scrape off all paint or other coatings. If old broken joints are being reglued, sandpaper or scrape carefully until all the old glue is removed.

RULE No. 3. Apply glue evenly in a smooth layer over all parts of the joint or over all points of contact. For best results apply on both surfaces wherever possible. A small brush or wooden spatula works well on most jobs. For larger surfaces a piece of an old hack-saw blade or an old windshield-wiper blade will make an excellent spreader.

RULE No. 4. Always make joints as tight fitting as possible before glue is applied. While some glues have limited capacity for filling in cracks and crevices in poorly fitted joints, all glues will hold better and look neater if joints are smoothly cut and snugly fitted. On fine cabinet or furniture work, trial assemblies are suggested before any gluing is actually done.

RULE No. 5. Clamp the work firmly in position, making certain that adequate pressure is applied and that individual pieces are in proper adjustment. Different types of clamps are available in hardware

(Concluded on page 82)

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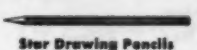

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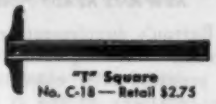

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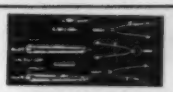

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ALL ABOUT GLUE

(Concluded from page 80)

stores in all sizes and shapes. They should always be positioned so that their jaws are square against the work, and so that pressure is uniform at all points. Always use protective blocks of scrap wood to prevent damaging the surface and to help spread the pressure evenly over the entire joint. Pressure should be just heavy enough to squeeze out the excess glue and to close the joint carefully. Too much pressure may warp or twist the work, and may squeeze out so much of the adhesive that the joint will be almost dry.

STRONG GLUE JOINTS

1. It is usually unnecessary, and often detrimental, to roughen the wood surface; in fact, the mating surfaces should be machined to a smooth, true fit.
2. Animal glue must not be overheated. Heating the wood is generally unnecessary or detrimental.
3. Glue should be thick, rather than thin, in consistency when it is pressed.
4. A relatively heavy pressure should be applied to bring the surfaces to be joined into firm contact until at least partial setting has occurred.
5. The surfaces to be glued together should be smooth and even. Make sure of this by holding the joint up to the light before gluing.
6. Dowel or mortise and tenon joints must be tight fitting.
7. Regardless of how much glue is applied, a weak bond will result from loose-fitting joints.
8. In repairing furniture, always scrape any old glue from the surfaces of the wood.
9. Apply a thin, even film of glue to both sides of the joint.
10. Let glued joints stand without strain for 24 hours after gluing, thus allowing the glue to season.
11. Minor details of procedure can be varied in any way that will assure a proper jellylike consistency of the glue at time of pressing.

— Ernst H. Suerken
Dobbs Ferry, N. Y.

Glue Types	*Brands*	*Principal Uses*	*Features*
Casein powder — mix with water before use	Casco	Heavy-duty, general woodworking where high strength and moderate resistance to moisture is needed — especially if oily woods are being used.	Can be used in unheated workshops (down to freezing). Has good filling action on poor fitting joints but is subject to mold and may stain dark woods.
Plastic resin (urea resin) powder — mix with water before use	Weldwood Cascamite	Fine furniture work, cabinetwork, and veneering — particularly where stain-free qualities and high moisture resistance are needed.	Gives strong joints which are light in color and very waterproof. It is not subject to mold and will not stain. Tight-fitting joints and heavy clamping pressures are needed.
Animal (Fish) glue — liquid ready to use	Franklin Le Page's	Heavy-duty, general woodworking where strong joints are needed and no dampness will be encountered.	Ready to use and light in color. It has good filling action on poor fitting joints. Good resistance to moderate heat and to mold.
White polyvinyl — liquid, ready to use	Presto-Set Glue-All	Light-duty, general household gluing of furniture joints and small assembly jobs which are not subject to stress or to dampness.	Dries absolutely clear and will not stain anything. It is always ready to use and is very quick setting. However, it will soften up if exposed to heat.
Resorcinal liquid and powder which must be mixed together before use	Elmer's Waterproof Weldwood Resorcinol	Absolutely waterproof joints in boats, outdoor furniture, sports equipment, and other jobs exposed to soaking, boiling, freezing, or contact with mild acids or alkalies.	Can withstand any exposure that will not harm the wood itself, and works well on filling in poorly fitted joints. Has dark color and cannot be used when temperature is below 70 degrees.
Contact liquid — ready to use	Weldwood Contact Elmer's Contact	Interior bonding of plastic laminates to plywood, and for cementing plywood panels to walls or studs or to other sheets of plywood or hardboard.	No clamping needed as it bonds instantly and permanently on contact. Must be used when temperature is at least 65 degrees.

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GIFTED STUDENTS

(Concluded from page 53)

entific principles, its use reflecting and illustrating these principles.

It also must be historically accurate, with general design conforming to the materials and methods of construction in use at the time of its discovery. One student, a master model-maker, constructed a working model of the steam gun carriage designed for use by Napoleon the first, a project that required the manufacture of component parts in keeping with design common to the early nineteenth century. Another student built a water wheel.

In addition, the project must be technically accurate, for all projects are expected to do the student, the laboratory, and the teacher honor. Poorly built projects never are entitled to a superior mark, be they ever so accurate scientifically and historically, for this is after all, an industrial arts program where projects must reflect proper understanding and use of tools, of materials, and of machines.

One objection to this program was voiced to the author by a fellow teacher who felt that the industrial arts department was infringing upon the province of a sister department. Even a cursory study of this objection reveals how specious it is: the advances of modern science have made the teaching of this subject so complex and so time consuming that science teachers must devote most of their efforts to a purely theoretical approach to the subject. We long have been teaching applied science in the electricity laboratory, so it is difficult to accept any objection to teaching *applied* heat, mechanics, or any other scientific discipline.

Before accepting any course of study, the instructor must first be sure it satisfies the stated and generally accepted objectives of industrial arts. By examining not only the present, but also the past and future of industry in their research and projects, and by sharing this experience with fellow students in the form of oral and written reports, students surely fulfill the objective of industrial arts to explore industry and our industrial civilization. By working in an area of endeavor of natural interest to them, students can logically be expected to develop an avocational interest. By using, as a class, a wide range of materials as a result of related discussions, consumer knowledges can be developed with this program as well as with any other. So, too, can one examine all objectives of industrial arts and fulfill them.

What are the specific benefits accruing from this course of study? It motivates the intelligent student to greater effort by presenting him with an area of instruction of natural interests to him; it requires, through committee work and reports, a fine degree of co-operative effort; and it serves to inform both administrators and the public that industrial arts has outgrown the manual training, let-us-make-a-sandpaper-block philosophy. ◀

An Enrichment Program for Industrial Arts

JAMES A. HALES

When several industrial arts students proposed additional classes for more thorough study, the author received permission from the local board of education and the administration to organize a program of enrichment.

A Saturday class meeting was selected because (1) regular school work would not interfere with the program and scheduling problems were at a minimum, (2) use of school facilities was possible, and (3) this period provided a longer, uninterrupted period of time for work setup and completion.

Procedural Details

The enrollment was based on interest in more advanced industrial arts study. Students were required to have an outstanding record of accomplishment in current and previous industrial study as well as a 2.5 cumulative average, based upon the four point system, in all other school subjects. It can be further noted that no credit is issued for the course.

Actual cost to the school was very small considering that facilities would normally be vacant. Salary for the instructor and the use of utilities appeared to be the only additional cost. All materials are purchased by the students.

The instructor's salary should be sufficient to make the time spent for class preparation worthwhile. It must be understood that with students of the caliber selected and a limited class size the instructor has an ideal teaching situation with students eager and determined to learn all that the instructor has the ability to present. The instructor's thorough knowledge of subject matter and adequate class preparation are therefore mandatory for a successful program. Students can quickly see through a teacher's mask and will stop attending a class on their own time if they are not challenged. Upon completion of the first year of the program attendance was averaging better than 95 per cent.

It must be recognized that each of the students had to be enrolled in the industrial arts curriculum which is a basic orientation and exploration of the major industrial processes. It was from this point that the special program begins.

Mr. Hales is an instructor of metals in the Solon, Ohio, High School.

Each student began his study from the point of his present ability and knowledge in the chosen area. The program functioned on the general unit shop basis with each area in operation simultaneously. The present program consisted of a general metals class active in the areas of foundry, forging, welding, and machine shop. The periods were of sufficient length (three hours) and the class of sufficient size (ten students) to permit the instructor to meet with each group individually during the period while all other groups are actively engaged.

Some objectives of the course, which should be considered by others planning a similar approach, were:

1. To challenge those gifted in the manipulative and technological skills.
2. To provide the student with a deeper interest in the areas of industry to the extent that his interest and ability and the school facilities permit.
3. To provide the student with a deeper understanding of the subject field as a method of meeting the challenge of the nation's need for more intense technological education.
4. To develop creativity by giving full explanations of the so-called "mechanical processes" and by insisting upon clear understanding on the part of the students.

In Evaluation

While it is still too early to complete a detailed follow-up study of the results of the program, evidence tends to indicate its worth. At the completion of the 1958–59 school year there were ten students enrolled in the program. Of the ten, two were graduating seniors. At the present time one is studying industrial arts education at a midwestern university and the other is an apprentice tool and die maker in one of the better industries. The eight remaining students are all re-enrolled in the current Saturday program.

The willingness of any industrial arts instructor and school administration to promote a program challenging to the gifted and providing them with an opportunity for creative development will be greatly appreciated by the American high school student. ◀

DR. BAWDEN

(Continued from page 22)

Further Formal Education

Realizing that he could not go much further in his chosen profession without advanced preparation, Mr. Bawden decided after four years of teaching in Buffalo to attend the Teachers College, Columbia University, and pursue a regular college curriculum for the preparation of industrial arts teachers. He obtained the bachelor of science degree from Teachers College in 1903, which gave him full credentials for teaching industrial arts. He recalls that at the conclusion of his senior year, he was selected to serve as a toastmaster at a luncheon which honored professor Richards.

College Teaching

In September of 1903, Mr. Bawden accepted a position as head of the newly created department of manual arts at the Illinois Normal University at Normal, Ill. This was the first such department for the training of manual arts teachers in Illinois. His first college job consisted of teaching three double periods of college students daily, one double period of training school pupils and supervision of handwork in the elementary grades of the training school. During his years at Normal, he saw his department grow in size and stature to the extent that a new building was constructed to house the rapidly-expanding industrial arts department.

In 1910 he was appointed assistant dean of the College of Engineering at the University of Illinois. His work there was largely administrative as he had no teaching assignment. After two years in which he acquired some very valuable administrative experience he decided to pursue a graduate study program.

Graduate Study

A leave of absence was secured from University of Illinois and in the fall of 1912 Mr. Bawden returned to Teachers College, Columbia University, on a graduate research scholarship to spend the next two years and summer sessions to earn the doctor of philosophy degree.

His graduate major was in administration of industrial education with a minor in social science. His advisory committee consisted of Drs. Frederick G. Bonsor, George D. Strayer, and Edward L. Thorndike, all well-known educators. While at Teachers College he contributed his first professional writing which was a chapter in the annual report of the United States Commissioner of Education for the year of 1914.

U. S. Office of Education

During 1914, Dr. P. P. Claxton, Commissioner of Education, secured an appropriation for "The Investigation of Rural and Industrial Education." The qualifications for this position were set so high, even in those days, as to require a doctor's degree. Since Dr. Bawden was the second person in the United States to receive a doctorate in industrial education, he was a natural and successful applicant for the position. He was appointed to the position of specialist in industrial and vocational education, taking office on August 26, 1914. This new position afforded Dr. Bawden the rich experiences and opportunities to visit and study programs throughout the United States whereby he could make substantial and informative reports concerning the progress, particularly of industrial education in its various aspects. This provided him the opportunity to meet people and thereby gain his first great insight into leading personalities in this young and growing educational field.

During his nine years with the United States Office of Education, he traveled to practically every state in the Union and Canada, and Mexico. He made numerous contributions to professional magazines and wrote many reports which are still on record of the early trials and tribulations of a field which received much national recognition during his time, and largely due to his efforts.

He was a strong advocate of the dinner-conference procedure to bring together leaders to discuss pressing topics. He did this on numerous occasions while in the U. S. Office of Education and generally he was designated as the chairman. This provided an opportunity for a group of national leaders to meet socially around dinner tables, and then to discuss professional interest matters which ultimately gave stature to the expanding industrial arts movement. These meetings provided the material for many of the now historical documents which are on file due to the meticulous recording of minutes and notes taken by Dr. Bawden.

He was also one of the first national officials to conduct organized surveys of public schools in America. These generally showed the need for increased educational importance of various facets of industrial education. His surveys not only pertained to the development of industrial arts, but assisted greatly in the promotion of trade programs throughout the nation. Space does not permit detailed listing of the many fine, data-packed surveys and studies which were conducted during his nine years in the U. S. Office of Education.

Administrative Experiences

In the fall of 1923, Dr. E. P. Claxton accepted the superintendency of the public schools in Tulsa, Okla. Due to the close relationship between Dr. Claxton and Dr. Bawden, it was not surprising to learn that Dr. Bawden had resigned his position in the U. S. Office of Education to accept a new position as associate superintendent of schools in Tulsa in charge of vocational education, industrial arts, and part-time and evening school programs in adult education. He inaugurated many new concepts in teaching, conferences, and clinics while in Tulsa. While in Tulsa he also taught in the summer programs at what is now Oklahoma State University in Stillwater.

Editorship

During the summer of 1928 Dr. Bawden resigned his position in Tulsa to become managing editor of the *Industrial Education* magazine, published by the Bennett Book Company in Peoria, Ill. He succeeded Emanuel E. Erickson who resigned to accept a position in the State Teachers College, Santa Barbara, Calif.

His first connections with the *manual Training* magazine, predecessor to *Industrial Education* magazine, was in 1899 where he displayed copies of the magazine at a state convention. The first reference to him in that magazine was in 1901 which described the assignment he held. His first article in the magazine was in 1903. This was followed by voluminous writings and book reviews until the magazine ceased publication in 1939.

He made an extensive study to find out what problems the teachers had to solve, what material the teachers would like to have, and what kind of illustrations would be most helpful for the magazine. He was constantly encouraging younger men of promise to give them the opportunity to grow professionally by means of contributions which they could make through the magazine. He was giving this type of encouragement to his graduate students at the Kansas State College of Pittsburg during the summers of 1932, 1933, and 1934 at which time the writer first met him while pursuing his master's degree. Those who were fortunate to be students in classes there or elsewhere can well attest to the fact that Dr. Bawden was a thorough, and very detailed teacher, and demanded the maximum from his students. His students always had the highest regard for him because of the knowledge which he possessed resulting from his varied experiences and knowledge of people. As editor of the magazine he was constantly encouraging prospective authors to develop manuscripts into book form.

Return to College Teaching

President W. A. Brandenburg, Sr., of the Kansas State College at Pittsburg, appointed Dr. Bawden as director of the graduate program and head of the industrial and vocational education department effective with the fall term of 1935. In this capacity, Dr. Bawden was able to give again in the educational preparation of prospective teachers his vast background of knowledge. The department developed into one of the most outstanding and successful graduate programs leading to the master's degree in the United States. He created and organized the Four-State (Arkansas, Missouri, Oklahoma, and Kansas) Conference, which today enjoys national recognition for its outstanding conferences and contributions to the field of industrial education. He retired from his active assignment as

head of the department due to the mandatory age stipulation in Kansas in 1945 to assume other responsibilities heretofore mentioned for the college.

There are very few present day leaders in the field of industrial education who can command the respect and have the reputation of having been associated actively with as many national professional organizations as did Dr. Bawden.

In 1908 he became an active member of the early National Society for the Promotion of Industrial Education which through subsequent reorganizations, became the present American Vocational Association in 1926. Through all of these organizational changes, Dr. Bawden held official positions and was regularly sought as a speaker or program director.

In 1934 a committee from the AVA prepared a report on "Standards of Attainment in Industrial Arts Teaching." Dr. Bawden served as its co-author and editor. This report, small in number of pages, was the forerunner to the current AVA publication, "A Guide to Improving Instruction in Industrial Arts" which had for its editor, one of his former students, the author of this tribute.

Dr. Bawden is also well known for his contributions and early inspiration in the formulation of the Manual Arts Conference of the Mississippi Valley, now known as the Industrial Arts Conference. The first meeting held in 1909 was called by the late Charles A. Bennett. Dr. Bawden was the first secretary and remained as secretary of this organization for the first five years. In 1924 Dr. Bawden was named chairman which he retained until his resignation in 1941. The membership of the conference accepted his resignation with reluctance, then elected Dr. Verne C. Fryklund of Stout State College as chairman, a position which he still holds.

Dr. Bawden retired from his active position as head of the department at the Kansas State College in 1945 after a very illustrious, comprehensive, professional career in industrial education. The president of the college requested that he remain and serve as director and editor of their numerous college publications which he did superbly until 1950. In the first year of his editorship duties, Mrs. Bawden passed away of a heart attack. In 1951 the President again asked him to spend the year writing the history of the college in preparation for the 50th anniversary of the founding of the college.

It was during this period of retirement that Dr. Bawden released some of his most important contributions to the literature of industrial education through the series of articles beginning in 1947 which dealt with "Leaders in Industrial Education." This development was the outgrowth of one of the graduate courses for which he was so well known and which usually carried the title of "Leaders and Movements in Industrial Education."

In 1949, Dr. William Thomas Bawden and Miss Maud Mary Firth were united in marriage. After serving actively 55 years in the interests of education Dr. Bawden moved from Pittsburg, Kans., to Tulsa, Okla., where Mrs. Bawden was still serving as director of home and family life education for the public schools.

His biographical sketch would not be complete without mentioning a few of the hundreds of honors which were accorded to this outstanding American citizen of education. He was reported in "Who's Who in America," "Leaders in Education," "Who's Who Among American Authors," "International Blue Book," and nine other biographical dictionaries.

In 1953, Dr. and Mrs. Bawden moved to Santa Barbara, Calif., so that they could participate in the many civic enterprises which that great city had to offer. Both were particularly active in their musical and civic activities which brought much enjoyment during Dr. Bawden's remaining years on the West Coast. His concluding statement of his autobiography is "It surely must not be considered surprising that I have many happy and satisfying 'recollections of a varied career.'"

Thus, it is most unique and fitting that this biographical sketch should conclude the series of magazine articles on "Leaders in Industrial Education" with this tribute to one of the greatest of all.

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a door could be placed on the front with compasses and other drawing instruments hung on the inside. Corresponding numbers have been placed on drawing board and rack so that each individual may be assigned responsibilty for care and use of board. The above photo shows a student returning a board to the storage cabinet.

Maurice F. Gupsill
Pueblo High School,
Tucson, Ariz.

ELIMINATING GLUE SPOTS ON WOOD PROJECTS

Junior high school shop students have difficulty in keeping glue off the surfaces of their wood projects. During the process of finishing their projects, a lighter area will usually be observed at the area where the glue has penetrated the pores of the wood and cannot be covered sufficiently by the finishing materials.

To overcome this difficulty, I suggested that the students, before applying the glue, should sand, stain, fill and seal the surfaces of the wood, except on the edges and joints to be assembled. Then, if the glue was accidentally dropped on the finished area, it could be readily removed by a wet sponge. This process will prevent the glue from penetrating the grain of the face.

Charles G. Cooper
Industrial Arts Instructor
Marion Consolidated School
Erie, Mich.

SHORT NOTES

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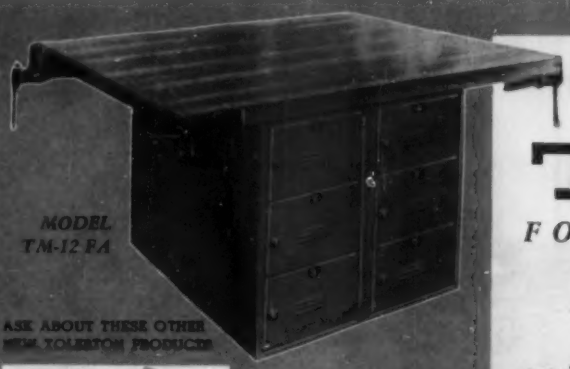

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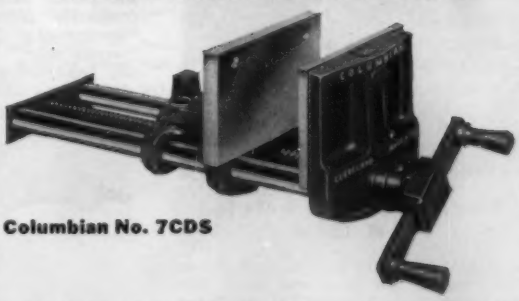

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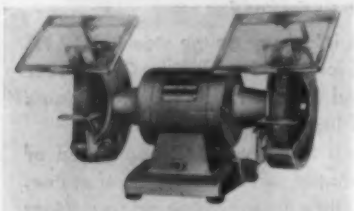

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end bell covers and two eye shields; (2) 6-in. standard model 286 without eye-shields and end bell covers; (3) 7-in. model 607 with ½ h.p. motor; (4) 8-in. model 614 with ½ h.p. motor with adjustable spark arrestors and tool rests and removable wheel guards; and (5) 10-in. model 617 with 1 h.p. motor for daily, heavy-duty use.

(For further details encircle index code 0701)

friction spindle brake From South Bend Lathe, Inc., machinery supplies including the new friction spindle brake for 13-in. lathes. This manually operated brake also disconnects power to the lathe motor

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(For further details encircle index code 0702)

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"Servicemaster" Polisher

(For further details encircle index code 0704)

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(For further details encircle index code 0705)

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(Continued on page 92)

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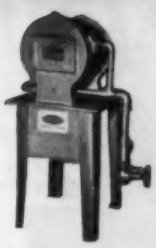

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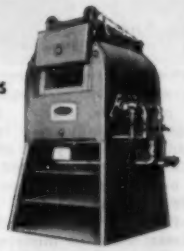

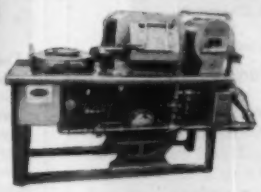

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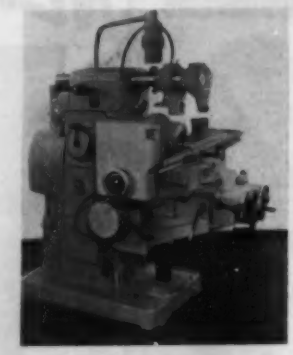
SHOP EQUIPMENT NEWS

(Continued from page 90)



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(For further details encircle index code 0707)

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(For further details encircle index code 0708)

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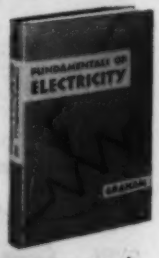

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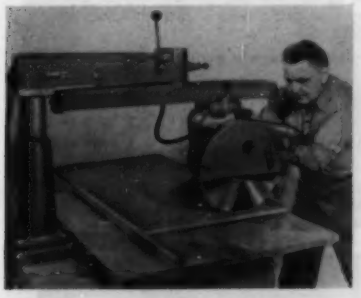
long arm radial saw From Rockwell Manufacturing Company's Delta Power Tool Division an extra capacity Delta Long Arm Radial Saw particularly suitable for use in the vocational building trades and vocational agriculture pro-

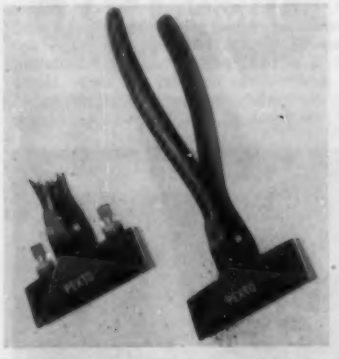


Long Arm Radial Saw

grams. The Delta 12–14 in., saw provides a longer track and overarm enables the saw to provide increased left-hand miter capacity, greater cross-cut capacity, and will easily trim a 24-in. wide panel for a cabinet door, and extra wide rip capacity. Outstanding features included in the new model are: double overarm construction; exclusive adjustable "Micro-Set" miter stops; enclosed lifetime trackways; up-front operating controls and adjustments. Capacities are: cross-cut — 1-in. stock, 24-in.; maximum rip capacity, 36 in.; maximum depth of cut, 4⅜ in.; dado capacity with 10-in. dado, 1½ in. wide., designed to stand up under extra heavy work loads over a long haul.

(For further details encircle index code 0709)

hand seamer From Peck, Stow & Wilcox Co., the standard Pexto hand seamer in a second model: No. 794 available without gauges for application on a variety of changing operations for speed



Pexto Hand Seamer Model No. 794

and ease of handling. No. 793 retains easy-set gauges for precise and accurate crimping. Both models have: forged tool steel construction for years of reliable service; precision-machined crimping edges; vista-green finish.

(For further details encircle index code 0710)

plywood blades From Disston Division of H. K. Porter Co., Inc., 6½- and 7¼-in. plywood cutting made exclusively

(Continued on next page)

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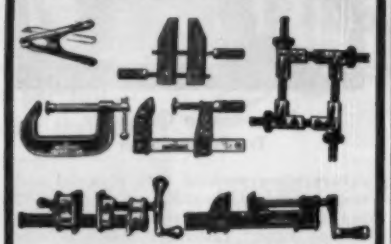

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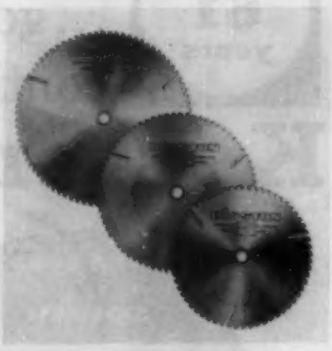
SHOP EQUIPMENT NEWS

(Continued from previous page)

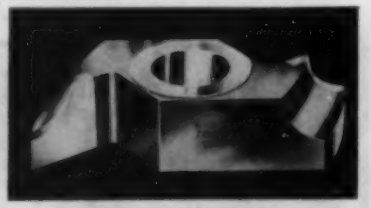


Plywood Cutting Circular Saw Blades

for portable electric saws. Blades (which cut smoother and quieter and do not splinter plywood) fit 16 of the popular portable saws (Disston, Black & Decker, Skil, Stanley, Porter-Cable, etc.) as well as many other bench and radial arm machines. Variety of packaging.

(For further details encircle index code 0711)

carbide cutters From Boice-Crane Co., a new line of Tru-Form, involute relief cutters with carbide tips for up to ten times the productive life of ordinary



Boice-Crane Company Tru-Form Cutter

cutters when working with plywood and resin-bonded chipboards, yet at 40 to 50 per cent below cost of equivalent tungsten-carbide tipped cutters. Employs a new sintered titanium carbide easily machinable in the soft state with hardening properties comparable to tungsten carbide or cast cobalt alloy tool components which eliminates diamond grinding and specialized labor skills. For cabinetwork, sash, and millwork; in ½-, 5/8-, and ¼-in. sizes for most makes of shapers.

(For further details encircle index code 0712)

drafting machine From V. & E. Manufacturing Co., Model 3300 Drafting Machine with 20-in. arms. Having all the important engineered features of their larger professional models, the 3300/20-in. Drafter is a compact instrument, yet covers a 34 by 44-in. drawing area — large enough for most everyday drafting requirements. The VEMCO 3300/20-in. Drafter has automatic, easily operated, smooth functioning indexing for positive settings at 15-deg. intervals or free rotation for setting at intermediate angles. The instrument is provided with modern disk brakes to aid in maintaining its position on a moderately inclined board. Ball joints within the elbow brackets permit easy lifting of the head and scales over objects on the board. VEMCO offers a varied line of 9-, 12-, 18-in., drafting machine scales, although the 3300 will accept any type drafting machine scale which has standard chuck plates.

(For further details encircle index code 0713)

magnetic shield From Dilley Manufacturing Co., 8 by 10 by ½-in. giant-based, Magnetic Grip Shield for precision lathe and other machine tools. Alnico magnetic base affords instant gripping of

Magnetic Grip Shield

the plexiglas shield which deflects all "shop-flak" (chips, dust, or splash) but does not hamper light and visibility. Five sizes of "head-to-toe protection" panels with two powers of magnetic bases.

(For further details encircle index code 0714)

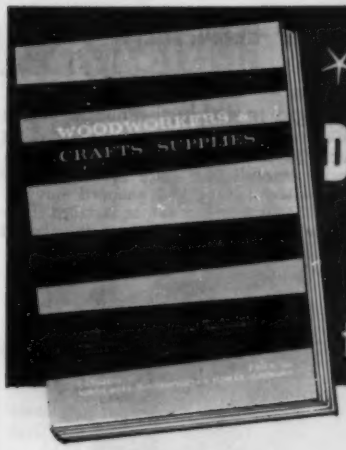
radio tester From Philco, a testing device, "Trace," which automatically guides a radio serviceman to faulty circuits and components in a transistor radio. The device is a rigid plastic panel facsimilating the actual radio circuitry. It easily aligns with the radio-printed circuit chassis panel and diagrams a complete test procedure

Trace for Transistor Radio Automatic Circuit Evaluator

for quick, foolproof servicing of Philco transistor radios. A set of nine (for Transistor Radio panels) will be made initially available to cover the current Philco line.

(For further details encircle index code 0715)

(Continued on page 96)



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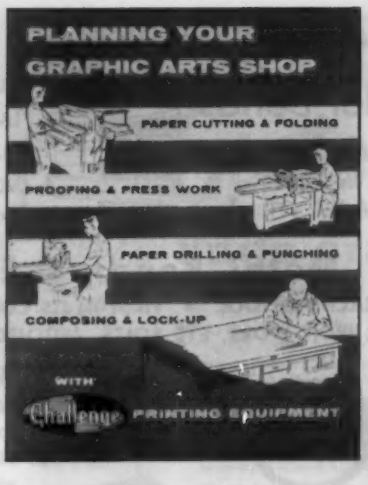

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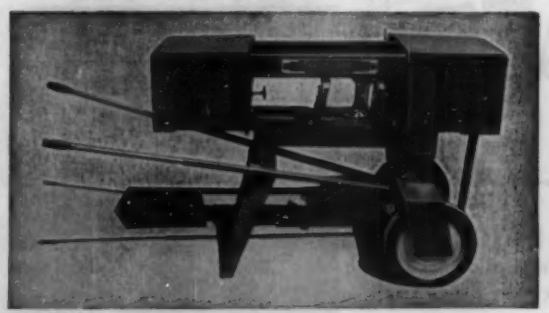

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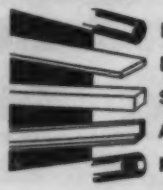

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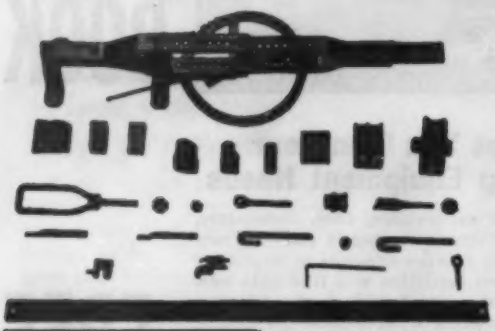

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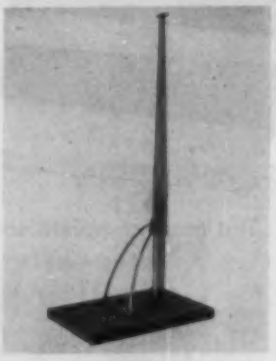
SHOP EQUIPMENT NEWS

(Continued from page 94)

folding metal leg From Wilkenson Manufacturing Co., flexible folding metal leg with two curved braces (for rigidity) easily snapped into place in the crossbar for instant setup, and snapped out for knockdown. Crossbar can be installed closer or farther from the leg base for slanted



Folding Metal Leg

or vertical positioning; leg, affixed to rotating disk, can be turned in complete circle or to any degree eliminating leg contact under the table. Self-leveling glide tip with 1-in. height adjustment for balanced rest. Polish brass leg sleeve; satin brass leg finish (will not corrode or chip); 28-in. over-all height.

(For further details encircle index code 0716)

tracmaster drafting machine From Universal Drafting Machine Corporation their new 60 Tracmaster drafting machine which provides an exceptional degree of drafting convenience, ease of operation and accuracy. Automatically balanced for use at any board angle and on boards from small to giant size without adjustment. The new Tracmaster Drafting

Tracmaster Drafting Machine

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(For further details encircle index code 0717)

(Continued on page 98)

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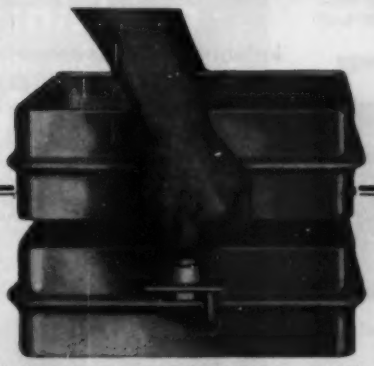

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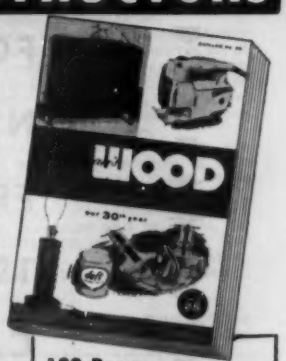

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SHOP EQUIPMENT NEWS

(Continued from page 96)

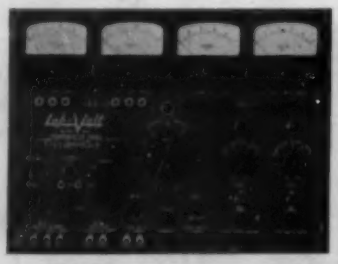
economy radial tool From DeWalt, Inc., an economy model (925-E) of their radial-arm wood and metal cutting machine to supplement existing "Power Shop" line. Without sacrifice of precision and accuracy, the 925E features: totally enclosed motor with 1.8 horsepower at the

DeWalt Home Workshop Machine — 925 "E"

cutting spindle; cam-type safety key switch actuating in any direction and removable at power shut-off; dual arbor motor shaft permitting use of low-cost right hand tools; 2½-in. cut depth; 24-in. ripping capacity; 15-in. crosscut capacity.

(For further details encircle index code 0718)

lab-volt panel power station From Buck Engineering Co., Inc., a new self-contained electrical power panel for use in educational electrical work — called the Lab-Volt Powermaster Panel Model 204, available in panel form for standard rack mounting, or cabineted for table or desk top use. It offers the following electrical services: continuously variable a.c.

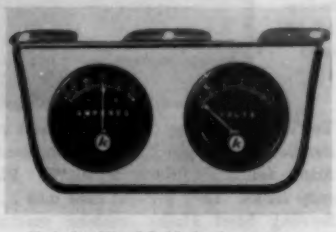


Lab-Volt Powermaster Panel Model 204

and d.c. high and low voltage; d.c. transistor and bias supply; a.c. filament and rectifier sources; continuity testing source; duplex line voltage outlet; and complete a.c. and d.c. metering service. All circuits protected by fuses accessible from panel front, all recepticles clearly and permanently identified with voltage and continuous duty amperage ratings. Construction of 12-gauge steel in gray-green baked enamel; all variable services having individual on-off switches and master switch providing overall on-off control. Supplies complete work-station service for two advanced students or complete demonstration facilities for secondary level science or industrial arts courses, complete with necessary mounting hardware and test leads.

(For further details encircle index code 0719)

knight-kit 12-volt ammeter-voltmeter kit From Allied Radio Corporation a kit for cars and boats, designed to provide more precise information than the flashing light indicators used on many late-model cars. The ammeter-voltmeter permits a constant check of electrical system operation, and shows malfunctioning of battery, generator or voltage regulator im-



Knight-Kit 12-Volt Ammeter-Voltmeter Kit

mediately. The kit consists of a voltmeter, ammeter, and panel with side-by-side meter cutouts. Chrome-plated panel trimmed with rubber, with under-dash universal mount-

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820 S. Tripp Chicago 24, Ill.

ing flange. Expanded scale voltmeter reads 9–15 volts, and the ammeter reads 30-0-30 amps. Illuminated by vibration-proof pilot lights, both meters are accurate to plus/minus 5 per cent and have white scales on a dark background. Listed under stock No. 83 Y 711, the kit is complete with No. 10 cables and instructions.

(For further details encircle index code 0720)

magazine rack From Stacor Equipment Co., library rack holding up to 40 magazines. Combining excellent display with large capacity, the rack is part of

Stacor Visionaire Library Rack

Visionaire's line which features intermembering units to fit existing equipment. Also available in a size designed to hold 23 periodicals.

(For further details encircle index code 0721)

glue spout From Desmond Bros., a convenient, built-in pouring spout for the economy 5-gallon drum of Deft Wood Finish. Interior spout, which drops neatly

Deft Wood Finish Drum
With Pouring Spout

down to pour the glue into smaller containers for individual users, eliminates messy overflow to catch on container rim. Small screw cap closes tightly to prevent spillage from accidental tipping. Unused Deft may be poured back into the drum; since it requires no stirring, Deft will not "skin" in the drum and will pour out to the last drop without waste.

(For further details encircle index code 0722)

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

illustrating course From Higgins Ink Co., a one-volume series of lessons for a course in technical illustration complete with lesson plans in the back of the book. Material concerns manuals industry finds increasingly necessary to assemble, service, and repair complex mechanisms (method of converting engineering plans into manual

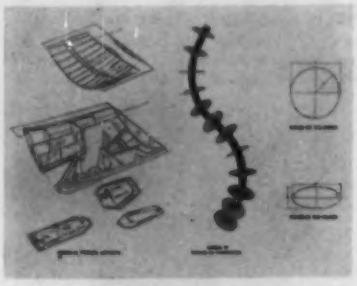
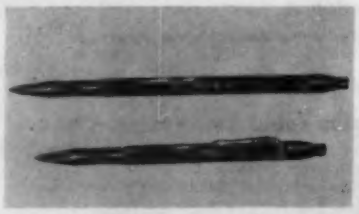


Illustration from Course in Technical Illustration

illustration, master of dimensionable perspectives, mastering of ellipses). Profusely illustrated, paper, 125 pp.

(For further details encircle index code 0723)

automatic lead pencil From Alvin & Co., Inc., Mark V "fine line" automatic propelling lead pencil. For use with letter



Mark V Automatic Propelling Pencil

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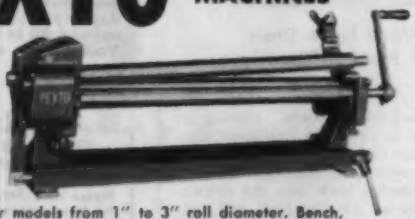

Other models from 1" to 3" roll diameter. Bench, floor and motor driven types. All quality built with PEXTO exclusive features.

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Length		Cut Smooth	Dead Smooth
8"	each	$1.80	$2.05
10"	each	2.05	2.40
12"	each	3.00	3.40
12"	cut coarse each		2.50

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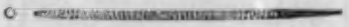

Very essential rasp on curved surfaces, recesses, grooves, enlarging and correcting run-off holes. Available in smooth and dead-smooth cuts.

Length	Approx. Size		Cut Smooth	Dead Smooth
6"	5/32"	each	$1.25	$1.35
8"	1/4"	each	1.65	1.95
10"	5/16"	each	1.85	2.35
12"	1/2"	each	2.10	2.75

Send for free 12 page folder on wood carving tools and supplies.

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guides or templates, it supplies an ever-pointed, extra thin (.031) lead. Six in. long, weighs less than ½ ounce; a non-rolling hexagonal barrel fits hand comfortably with knurled, tapered finger grip. Quick-acting, push-button, fully automatic lead feed (breech-loaded through top) for one-hand operation. Jet black finish, color coded caps indicating degree of head hardness. Available in two models: Mark V (standard) and Mark V-P (special pocket model, 5¼ in. long with pocket clip). Each lead holder comes supplied with ½-dozen extra refill leads available in 9 degrees of lead hardness: 3B, 2B, B, HB, F, H, 2H, 3H, and 4H.

(For further details encircle index code 0724)

world globe for radio amateurs

From Allied Radio Corporation a new 12-in., full-color world globe, designed for use by radio amateurs and shortwave listeners. It incorporates special Allied-inspired features that make it a valuable accessory in the ham station or the short-

World Globe for Radio Amateurs

wave listening post. Unique indicating devices tell the user the direction in degrees and the distance of any country from his own location, which will appeal particularly to amateurs with rotary beams, and those installing fixed-type directional antennas. A directional disk is calibrated from 0 to 360 degrees, and a mileage strip from 0 to 12,500 miles, calibrated in 500-mile segments. When the mileage strip is moved to the country desired, both distance and direction in degrees are indicated simultaneously. A special pivot post for these indicators permits "customizing" the globe for any location. Stock No. 77 S 325.

(For further details encircle index code 0725)

projector-film set From Stanley, a special school combination offer of the Graflex Instructor 150 projector and a film library of six sets of 53 strip (820 frames) on 35mm. safety film on the proper use and care of tools. The strips, individually packaged in cans and a convenient storage box with manual of suggested questions for testing, considers such subjects as hand saws for woodworking; hammers; screw driver, nails, and screws, etc. The project features push-button film advance, ejector button, sharp, 3 in. f/3.5 lens, thumb-action elevator adjustment, etc.

(For further details encircle index code 0726)

autograph pencil From Venus Pen and Pencil Corp., an autograph lead pencil with a smooth, white, "write-in" panel for owner's name, or brief message. Available in color-assorted packets.

(For further details encircle index code 0727)

descriptive materials

From Electronic Instrument Company, Inc., (EICO) a 28-page catalog covering its complete line of stereo and mono high fidelity, test instruments, ham equipment, citizen transceivers, and radios in both kit and wired form. Pix, detailed descriptions, specifications, prices as of May, 1960.

(For further details encircle index code 0728)

From Skil Corp., full-line 8½ by 11-in., two-fold mailer with photos and condensed specifications of saws, drills, routers, planes, belt and disk sanders, shears, drivers, portable and bench grinders, polishers, blowers, pneumatic tools, and abrasive products. Also covers recently introduced reciptro saw and new Roto-Hammers.

(For further details encircle index code 0729)

From Challenge Machinery Co., 8-page booklet describing its power cutters in sizes most used by small and medium-sized printers, private plants, school shops, and duplicating operations. Includes suggestions on paper cutting operations to save time and boost production, complete information on various models, on operating features, and handy accessories. Publication F-638.

(For further details encircle index code 0730)

From Chicago-Latrobe, a 68-page, 8½ by 11-in. catalog of drills, reamers, power bits, arbors, etc. (the firm's line of 22 "Double Clutch" tools) easy to use, including specifications and prices; also a numerical and alphabetical index.

(For further details encircle index code 0731)

From Cincinnati Milling Machine Company, a 15-page two-color folder containing descriptive articles covering a new concept in centerless grinding, Telematic control programs, automatic milling cycles through simple plug-in selections, new intraform cold works tubing blanks to 50 ft. long, Acramatic — the versatile new guidance system, and electrical discharge machining.

(For further details encircle index code 0732)

From Columbian Vise & Mfg. Company, a miniature catalog describing the complete line of Columbian Machinists' Vises, in addition to detailed specifications of the company's base vises, and listing Columbian design and construction features. Leaflet L-2007A.

(For further details encircle index code 0733)

From The Columbia-Hallowell Division, SPS Company, a new six-page folder featuring the theme "a whole new world of office efficiency" to describe its lines of office desks and chairs. Pictured and described are the Columbia Meridian collection of executive desks and matching credenzas, and the nine-to-five group of modular unit work centers which can be customized to fit individual job requirements. Also featured are space-saving Ampla desks. Columbia standard office desks and extensive line of office chairs round out the new literature piece.

(For further details encircle index code 0734)

From Eastman Kodak Company, three new Kodak pamphlets offering concrete suggestions on techniques and tools to facilitate and improve both the production and use of photo visuals in schools and in industry. No. T-12 — "Curriculum Materials Center" — 4-page, descriptive pamphlet, giving a floor plan for such an area which includes preview booths and equipment storage, planning production of art work and photo visuals, a darkroom for production of photo visuals, picture-

(Continued on next page)

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Giant Illustrated Guide to Auto Repair

Step-by-Step Directions, Large Show-How Pictures Simplify Every Procedure

MOTOR's Manual, the "Auto Repair Man's Bible," puts everything your students need to know about auto repairs at their fingertips. It shows them how to spot troubles in a jiffy, where to start a job, which tools to use, *what* to do and *how* to do any job *quickly, easily, right* the first time.

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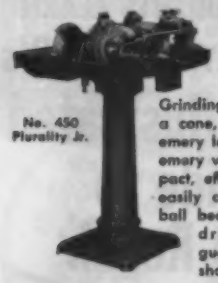

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taking equipment, reproduction of materials, film inspection and repair, storage, and a curriculum materials library. "Planningboards," Kodak Pamphlet No. T-21, 4-page pamphlet describing the particular features of the boards, and listing materials needed, also giving plans for construction of two planning-boards. "Illuminator for Slide Sequences," Kodak Pamphlet No. T-20, two-page leaflet that provides plans for construction of an illuminator for audio-visual planning. An earlier publication, "Planning and Producing Visual Aids," No. S-13, also available.

(For further details encircle index code 0735)

from the field

Fred J. Gross, manager of educational sales of Stanley Tools, New Britain, Conn., completed 50 years of continuous service with the hand tool division on June 30, 1960, and retired at that time. Well-known from

Fred J. Gross

coast-to-coast for his contributions to the upgrading of school shop facilities and a pioneer in the field of school relations for industrial firms serving the schools, he has been honored and rewarded by various organizations for his outstanding service and his interest in vocational education and his counsel to teachers of the practical arts. Through his efforts a number of teaching devices were developed which are distributed to shops by Stanley Tools.

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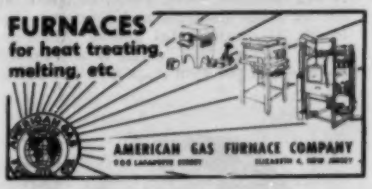
FURNACES for heat treating, melting, etc.



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Code No.		Page No.
90	Abernathy Vise & Tool Co.	66
91	Adjustable Clamp Company	70
92	Allied Radio Corp., The	92
93	Alvin & Company	81
94	American Air Filter Co.	69
95	American Gas Furnace Co.	102
96	American Technical Society	66
97	American Technical Society	92
98	Armstrong Bros. Tool Co.	12
99	Atlas Press Company, The	15
910	Bedford Lumber Co.	67
911	Bennett Co., Inc., Chas. A.	80
912	Bergen Arts & Crafts	76
913	Berger Scientific Supplies Corp.	72
914	Better Light, Better Sight Bureau	82
915	Black and Decker Mfg. Co.	6 & 7
916	Bolce-Crane Company	74
917	Brodhead-Garrett Company	71
918	Bruce Publishing Company	3rd cover
919	Can-Pro Corporation	87
920	Challenge Machinery Co.	95
921	Chandler & Price Co.	60
922	Cincinnati Tool Company, The	93
923	Columbian Vise & Mfg. Co.	89
924	Constantine & Son, Inc., Albert	88
925	Cope Plastics Co. — Illinois	81
926	Craftsman Wood Service Co.	97
927	Craft Metal Corporation	99
928	Delta Power Tool Div. Rockwell Mfg. Co.	5
929	Diamond Tool & Horseshoe Co.	2nd cover
930	DonJer Products	102
941	Hammett Company, J. L.	100
932	Duro Metal Products Co.	59
933	EICO	73
934	Foley Lumber Company, T. A.	98
935	Gearon Company	96
936	General Finishes Sales & Service Co.	99
937	General Scientific Equipment Company	70
938	Giles and Kendall Co.	102
939	Goodheart-Willcox Co., Inc.	76
940	Gyro Lamp & Shade Corp.	102
941	Hammett Company, J. L.	100
942	Hardwood Corp. of America	94
943	Higgins Ink Co., Inc.	77
944	Hones, Inc., Charles A.	73
945	Hossfeld Manufacturing Co.	96
946	Immerman & Sons	96
947	Industrial Arts Supply	100
948	Irwin Auger Bit Co.	12
949	Jacobs Mfg. Co., The	2
950	Johnson Gas Appliance Co.	78
951	Kalamazoo Tank & Silo Co.	95
952	Kasenit Co.	98
953	K-D Manufacturing Co.	97
954	Kester Solder Company	93
955	King Machine & Mfg. Co.	4
956	Larson Co., J. C.	99
957	LeBlond Machine Tool Co., R. K.	4th cover
958	Logan Engineering Company	22
959	Magnaflux Corp.	81
960	Magnaflux Corp.	97
961	McGraw-Hill Book Co., Inc.	88
962	McKnight and McKnight	Ins. bet. 82 & 85
963	Millers Falls Company	16
964	Minnesota Woodworkers Supply Company	95
965	Mittermeier, Frank	100
966	Modern School Supplies	102
967	Morgan Vise Company	11
968	Motor Book Dept.	101
969	Mummert Dixon Company	102
970	Mutual Aids	102
971	Northfield Foundry & Machine Company	19
972	Ohmite Manufacturing Co.	77
973	Oliver Machinery Co.	68

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION — September, 1960
400 North Broadway, Milwaukee 1, Wisconsin

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(Continued)

Code No.		Page No.
974	O'Neil Irwin Mfg. Company	20
975	Parent Metal Products, Inc.	91
976	Patterson Bros.	102
977	Peck, Stow & Wilcox Co.	100
978	Philco TechRep Division	24
979	Post Company, Frederick	75
980	Powermatic Machine Co.	13
981	St. Louis Crafts, Inc.	102
982	Sax Bros. Arts & Crafts	102
983	Seeley's Ceramic Studio	100
984	Sheldon Machine Co., Inc.	8
985	Skil Corporation	14
986	Snap-on Tools Corporation	10
987	South Bend Lathe, Inc.	1
988	Southern Screw Company	91
989	Stacor Equipment Company	79
990	Stanley Tools	9
991	Starrett Co., The L. S.	23
992	Sterling National Industries, Inc.	97
993	Stoner Wood Products Co.	100
994	Sunbeam Equipment Corp.	91
995	Swayne, Robinson & Co.	70
996	Tandy Leather Company	100
997	Toledo Metal Furniture Co.	93
998	Tolerton Co., The	89
999	United Shoe Machinery Co.	17
9100	Universal Drafting Machine Corp.	77
9101	Universal Scientific Corp.	92
9102	Upholstery Supply Co., The	95
9103	V & E Mfg. Company	89
9104	Venus Pen & Pencil Corp.	78
9105	Versa-Vise	12
9106	Wells Lumber Co., J. W.	76
9107	Western Materials Company	88
9108	Wilkenson Mfg. Co.	91
9109	Williams & Co., J. H.	72
9110	Wilton Tool Mfg. Co.	21
9111	Yates American Machine Co.	66

SHOP EQUIPMENT NEWS

Code No.		Page No.
0701	Skil Corp. Bench Grinder	90
0702	South Bend Lathe, Inc. Friction Spindle Brake	90
0703	U. S. Burke Machine Tool Co. Milling Machines	90
0704	Black & Decker Mfg. Co. Polisher and Sander	90
0705	Electronic Instrument Co., Inc. Practice Oscillator	90
0706	Borden Chemical Co. Floor Grip	90
0707	Brown & Sharpe Mfg. Co. Milling Machines	90
0708	Acromark Co. Acromark Printer	92
0709	Rockwell Mfg. Co., Delta Power Tool Div. Long Arm Radial Saw	93
0710	Peck, Stow & Wilcox Co. Hand Seamer	93
0711	Disston Division of H. K. Porter Co., Inc. Plywood Blades	93
0712	Boice-Crane Co. Carbide Cutters	94
0713	V. & E. Manufacturing Co. Drafting Machine	94
0714	Dilley Manufacturing Co. Magnetic Shield	94
0715	Philco Corp. Radio Tester	94
0716	Wilkenson Mfg. Co. Folding Metal Leg	96
0717	Universal Drafting Machine Corp. Tracmaster Drafting Machine	96
0718	DeWalt, Inc. Home Workshop Machine	98
0719	Buck Engineering Co., Inc. Lab-Volt Panel Power Station	98
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0725	Allied Radio Corp. World Globe for Radio Amateurs	101
0726	Stanley Works Projector-Film Set	101
0727	Venus Pen and Pencil Corp. Autograph Pencil	101
0728	Electronic Instrument Co., Inc. Catalog	101
0729	Skil Corp. Two-Fold Mailer	101
0730	Challenge Machinery Co. Booklet on Power Cutters	101
0731	Chicago-Latrobe Catalog	101
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0733	Columbian Vise & Mfg. Co. Leaflet L-2007A	101
0734	The Columbia-Hallowell Div., SPS Co. Six-Page Folder	101
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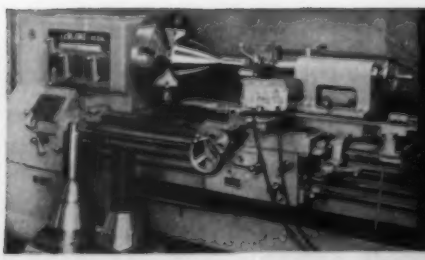

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